



FRIDAY, APRIL 2, 1897.

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## Electrical Equipment of the Illinois Central.

Within the last week there has been a great revival of the statements that the Illinois Central is to equip its lines for suburban working with electricity. All of our readers know that this statement has been made at frequent intervals for the last five years. They also know that Mr. Wallace has been recently engaged in a very careful and thorough study of the subject, and none of us would be much surprised any time to know that bids were to be asked for.

We can say, however, on the best authority, that no bids have been asked for yet for the electrical equipment of the Illinois Central's suburban lines between Randolph and Sixty-third streets, inclusive, in Chicago, and we can say further that such bids are not likely to be asked for at present. It is true that the Board of Directors have come to the conclusion that it will be expedient to work that part of their system by electricity. They have authorized the President to pursue his inquiries into this matter with a view to opening negotiations for the necessary plant. It is still too early, however, to say when the electrical service will be put into use, and for the present the decision of the United States Supreme Court in the Trans-Missouri case makes it very doubtful indeed whether it will be at all worth while for railroad companies to invest additional money in their business. That consideration alone is enough to postpone for the present definite action on this costly project.

## The New Grand Trunk Bridge.

The great steel arch spanning the Niagara gorge was closed on Monday of this week, and soon the old suspension bridge will be a mere matter of history. We have so recently described the new bridge that it is not necessary now to say much about it. For particulars the reader is referred to an article appearing in the *Railroad Gazette*, April 24, 1896, where a pretty thorough description, with illustrations, may be found. A later article, showing the foundations, was published in our issue of Oct. 16. It may be well, however, to recapitulate a few facts.

This bridge is built by the Niagara Falls International Bridge Company and the Niagara Falls Suspension Bridge Company for the use of the Grand Trunk Railway, and it will replace the suspension bridge now owned and used by the above companies. Mr. L. L. Buck, who reconstructed the suspension bridge, is Chief Engineer of this new bridge. It is being built under the general supervision of his assistant, Mr. R. S. Buck, and the contractor for the superstructure (material and erection) is the Pennsylvania Steel Company. The main span is 550 ft. long between centers of end pins. It rises 114 ft. above the skewbacks. It rests on abutments let into the rock faces of the gorge. The bridge has two decks, the upper one carrying two railroad tracks, the lower one carrying the highway, sidewalks and trolley car tracks. The axes of the old and the new bridges coincide pretty closely, and provision has to be made for carrying the traffic on the existing bridge while the new one is building. The new bridge is with one exception the longest arch span in the world, the longest one being that of Luis I. at Oporto, Portugal, namely 566 ft. Probably the new bridge will be done next June.

## The Pittsburgh, Bessemer &amp; Lake Erie Steel Cars.

The Pittsburgh, Bessemer & Lake Erie Railroad, as has been noted in these columns, asked a number of car and bridge builders to tender for building 200 cars, wholly of metal, which meant building the bodies, underframing and truck frames of steel. The builders were asked to furnish modified designs if they wished, with prices, as well as a price on the design which had been

worked out by the engineers of the Carnegie Steel Company.

Last Friday the road concluded a contract with the Schoen Pressed Steel Company, of Pittsburgh, increasing the number to 600 cars, one-half to be built according to the plans furnished by the Carnegie Steel Company, the other half to be built according to the design which had been worked out by Mr. Charles T. Schoen.

One-half of the entire number of cars are to be equipped with the Schoen Pressed Steel Company's pedestal type of truck frame, the balance to be equipped with the Fox, Kindl, Cloud, Pennsylvania Railroad and Goltra types of truck.

This is a good start for the long talked of revolution in the construction of freight equipment. If these cars, being as they are, of 100,000 lbs. capacity, prove all that is claimed for them, we may expect other orders for steel cars to quickly follow. These cars are expected to demonstrate that per ton of carrying capacity they can be built as cheaply as a well-designed modern car built of wood and iron, to say nothing of a great saving in maintenance and in the cost of transporting at least 5,000 lbs. of dead weight per car.

The Schoen Pressed Steel Company and Mr. Charles T. Schoen are entitled to great credit in having been able to submit a design, and also in having been sufficiently well equipped for this class of work to undertake to complete the entire contract, amounting to about \$600,000 in 90 days.

## Electric Motors at the Baldwin Locomotive Works.

The installation of small electric motors in the Baldwin Locomotive Works is an important example of a radical change in machine shop practice. The large electric cranes in the erecting shop have been fully described in the *Railroad Gazette* and are doubtless familiar to the reader. Following their installation, other modifications have been made throughout the entire shop, and in place of the long line shafting to which the machines were belted, independent electric motors are used in nearly all the different departments to operate the machines. Electric cranes are also being introduced in many of the shops, this being made possible only by the abandonment of the belts and shafting. Thus the floor space can be used to better advantage and better light can be obtained. These changes will in some degree enable the machinist to do better work and more of it, and the electric motor doubtless gives an actual saving of power; but there are other considerations that should not be overlooked in discussing the relative merits of the old and the new systems. The electric motor is unquestionably economical where the average amount of power used is very small compared with the total output of the engine. A comparison may be made with the power used on a cable road. Here the cable corresponds to the line shafting and the friction in the rollers on which the rope moves to the friction in the bearings of the shaft. If many cars are running the power required to drive the cable is small compared with the total horse-power of the engine, but where there are few cars running on a long cable road the wasted power may be many times the power required to drive the cars. Thus we find in the Baldwin shops the total capacity of the motors fitted to the tools (not including the cranes) is about 200 H. P., while the capacity of the generators which supply the current for the motors is 100 H. P., and their actual output is ordinarily 80 H. P. In this connection we publish diagrams which originally appeared in the *Electrical Engineer*, showing the estimated saving of power in a machine shop when operated by small motors. The two upper diagrams were plotted from indicator card readings taken every 15 minutes during the day's run at the factory of the Central Stamping Company, Brooklyn. The power required to run the shafting, belting, etc., without tools was taken in the morning after the engine had started and before the day's work had begun. The lower diagrams show the same engine loss and the same useful work with 15-minute observations. Exactly similar conditions would not exist in any other shop, and the lost power might be more or less than in this case. The friction losses of the bearings between the engines and the generators and between the motors and machines do not appear to be given, but are quantities which should not be overlooked or discarded. In the Baldwin shops nearly all the motors are connected by belts to the machines, this method having proved the more satisfactory. Where gearing is used there is a danger of breaking the teeth should the machine be stopped suddenly, whereas if the same difficulties occur where the belt-driven machinery is used, the belt will fly off or the fuse may burn out and no damage will occur.

We are indebted to Messrs. Vaucian and Halsey, of the Baldwin Locomotive Works, for the following information in regard to the present status of the work of changing the shop methods.

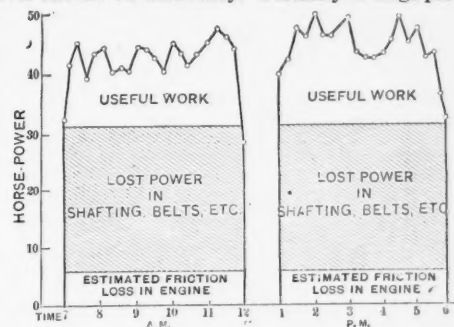
In the Baldwin Locomotive Works, the electric power is developed by two Westinghouse compound engines which are connected by belts with two 100-H. P. generators and with two Kodak 250 H. P. generators, both Westinghouse machines. The dynamos of the smaller units are in a room adjoining the cylinder shop, and these will soon be rewound so that they can be worked as one machine. The Kodak generators, which are placed near the machine shop, can be run either separately or in unison, and can also be run in conjunction with the 100 H. P. generators.

\* See issue of April 12, 1895.

In the cylinder shop, the six 6-ton jib cranes made by William Sellers & Co., are operated by electric motors, and in the erecting shop, which is 350 ft. long by 150 ft. wide, two cranes of 100 tons, capacity each, previously referred to, have been in successful operation for a long time. Besides the above, small portable drills are used in the erecting shop, and a 15-H. P. Westinghouse motor runs a line of shafting at the Broad street end of the shop, to which are belted drills, boring machines and other tools.

The boiler shop now contains a 25-ton steam crane. This shop will be altered so that three electric cranes having a span of nearly 60 ft. each will be free to run the entire length, 345 ft., and the steam crane will be changed to be driven by electric power. Six 10-ton electric traveling cranes, the five-ton jib cranes and the shears and rollers will also eventually be operated by small motors.

The wheel shop, which adjoins the boiler shop, furnishes an illustration of the advantage of electric motors over belt-driven machinery. Formerly a large part of



Average I. H. P., 44.1.

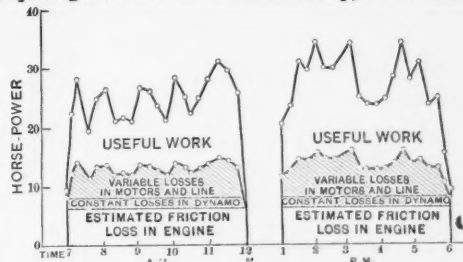
Power Test, Factory "K," Central Stamping Co., Brooklyn, N. Y.

the space was taken up by the belts and the shafting. Now the 10-ton crane, which is driven by a 10-H. P. motor, has a travel of 300 ft., and the castings can be carried from one end to the other without interfering with the work of the intermediate machines. This shop will also be remodeled and will contain five-ton cranes, each having a span of 25 ft. and a travel of 250 ft. At present the 12-wheel lathes are each supplied with 7-H. P. motors. The seven horizontal boring machines, two quartering machines and the large rotary planer are also driven by means of electricity.

The frame shop is 300 ft. long by 65 ft. wide. Three five-ton traveling cranes receive their power from 20-H. P. motors. A test on one of these cranes gave the following results:

	A.	V.	H. P.
Motor only.....	4	250	1.3
Motor with clutches.....	6	259	2.0
Bridge—starting.....	40	250	13.3
Bridge—running 300 ft. per min.....	19	250	6.4
Traversing trolley.....	8	250	2.7
Raising hook.....	9	250	3.0
Lowering hook.....	8	250	2.7
Loaded with 8,500 pounds.			
Lifting at 8 ft. per min.....	32	230	9.9
Lowering at 8 ft. per min.....	13	240	4.4
Traversing trolley.....	19	260	3.4
Bridge—starting.....	60	160	20.8
Bridge—running 300 ft. per min.....	20	230	6.2

The Sellers new, quick-return planers, with a ratio of return of 4 to 1, are driven by 20-H. P. motors. These machines will plane pieces 35 ft. long, and the distance between the housings is 5 ft. 2 in. In planing locomotive frames (wrought iron) it was found that with a cut  $\frac{1}{8}$  in. deep and  $\frac{1}{4}$  in. feed, and making two cuts, 21.6 H. P. was required. The empty table at the moment of reversing consumed 17 to 18.6 H. P., the motor and counter shaft requiring 4.4 H. P. In the frame shop, three double-



Average I. H. P., 25.4.

Losses in Same Plant with Electrical Transmission.

head slotting machines driven by two 10-H. P. motors, eight single slotters using 7-H. P. motors, three double head and two triple-head frame drills for drilling, each requiring 7-H. P. motors, and four planers run by motors of 10 H. P. each are now being used. On the top floor of the same building is the general machine shop, driven by two 30-H. P. motors, which in turn drive a line shaft which runs the entire length of the building, 350 ft.

In the foundry is found three jib cranes of  $7\frac{1}{2}$ -H. P. each, and a traveling crane having a span of 4 ft. using 5-H. P. motors running the entire length, 400 ft., and is used to carry the castings from one end of the room to the other.

In the tender shop we find one 15-H. P. motor operating a crane with a span of 28 ft. and having a running dis-

tance of 180 ft., and eight drills each operated by 3-H. P. motors. On the fourth floor of the same building a 30-ton traveling crane with a span of 36 ft. runs the entire length, 130 ft., and uses two 15-H. P. motors. This floor also contains six electric winches 5 H. P. each, and in this building an electric elevator with 45,000 lbs. capacity and occupying a floor space of 15 x 28 ft. is used to carry

product out of a given amount of machinery when driven by electricity. Further, considerable time was saved in changing work where overhead machinery was employed.

Under the item of annual expense for repairs and frequency and extent of failures, Professor Jackson sums up the general opinion in the manufacturing establish-

making the change from mechanical to electrical transmission in established plants, while in many plants where this condition would not commonly exist the arrangement of buildings or the growth of the plant frequently gives an advantage to electrical transmission either as an auxiliary to the main transmission or as a rival to the existing mechanical transmission. More

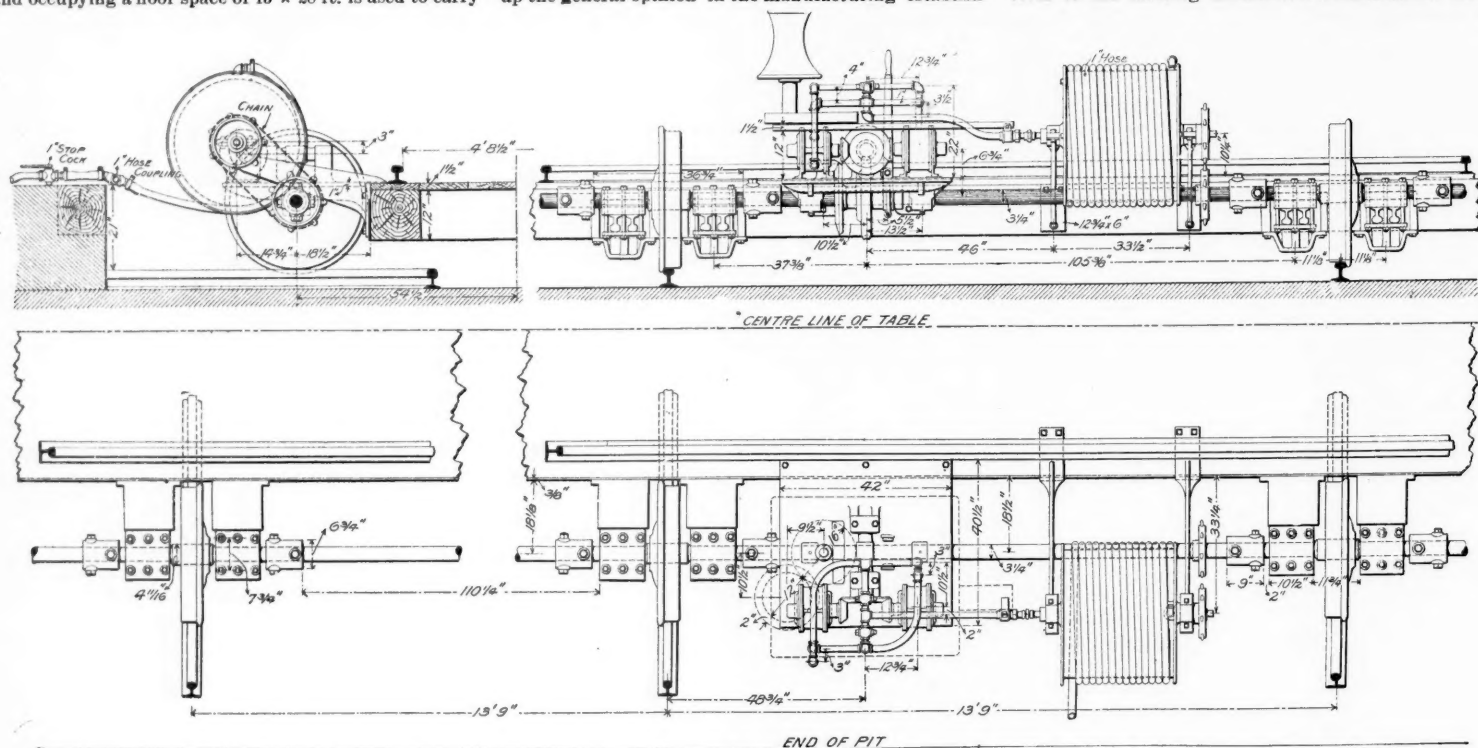


Fig. 24.—Pneumatic Driving Gear for Transfer Table—Topeka Shops of the Atchison, Topeka & Santa Fe.

tenders from the ground floor to the top floor, where they are painted, completed and stored. This elevator is driven by a 30-H. P. motor.

Besides the above, small electric motors are used in the pattern shop, test-room, gibb and wedge department and in the extra work department.

The Gibbs motors are used almost exclusively in the Baldwin shops and have met every requirement. In the *Railroad Gazette* of Aug. 24, 1894, we described the Gibbs slow speed motors, and the issue of July 26, 1895, contained an illustrated description of the variable speed motors also made by the Gibbs Electric Company, and designed to run at 850, 165, 93 and 38 revolutions per minute. The efficiency of motors designed to run at slow speed is much higher when running at a slow speed than a high speed motor when running at a low speed. In the variable speed motors we have the conditions which enable the motor to run efficiently and give the machinist a choice of speeds which in many cases is necessary. With the shafting, a change of speed necessitates a shifting of the belt, and while this does not require much time, still it is an element that cannot be disregarded in comparing the two methods.

Prof. D. C. Jackson, of the University of Wisconsin, has given extended study to the subject of electric power in manufacturing establishments and presents the matter concisely in a paper read before the Western Society of Engineers. In order to obtain facts as to the advantages and disadvantages of electrical transmission he submitted questions to a large number of establishments, covering a wide range of industries from iron mills and locomotive works to spinning mills. These vary in extent of electrical power applied from 50 to 1,500 H. P. Professor Jackson discusses the subject under two principal heads: A, comparative first cost; B, comparative operating expenses.

A. In the case of new establishments he finds that the first cost of electrical transmission is nearly always considerably greater than the first cost of mechanical transmission, such as by gears and shafting, belts and shafting or ropes and shafting. The electrical apparatus being under ordinary conditions more costly, a sufficient annual saving must be made to pay a profit on its extra first cost. In the case of an established concern, a proposed change means an abandonment of much of the operating machinery. The question of saving in this case cannot be decided without a consideration of the comparative operating advantages.

B. Professor Jackson divides this part of the subject so as to include all the items that would be affected by the change, and first takes up the annual expenses for fuel and attendance. In nearly every case only general results were given, and it will be understood that it is a very difficult matter to make a fair comparison between the two methods and that the best general comparison that can be made is in relation to the fuel expense. One company notes a fuel economy of 33½ per cent. on its plant with 185 H. P., and another that operates a power plant aggregating 1,537 H. P. states that no appreciable difference was noted between the old and the new method. This last plant, however, reports that the repairs to the motors are much less than formerly to belts and line shafting, and that it is able to get a considerably larger

ments thus: "There is an overwhelming feeling in favor of the use of electrical transmission in preference to various forms of mechanical transmission, on the combined score of economy of operation and a reduced annoyance and expense through delays caused by the failure of transmission apparatus." In regard to the convenience, he finds that in establishments turning out a product of bulky or heavy articles the electrical equipment adds materially to the shop efficiency; and in establishments where the product is in small articles, and

concisely, Professor Jackson finds that all large tools, such as used from 5 to 7½ H. P. and over, should be supplied with individual motors, while small tools of machines requiring less power should be grouped and driven from line shafting, these groups to be arranged so that a motor of not less than 3 H. P. capacity is used and not more than from 10 to 15 H. P.

In the paper it was stated that in the average manufacturing establishment a 220-volt continuous current system seems to promise the best results, though more

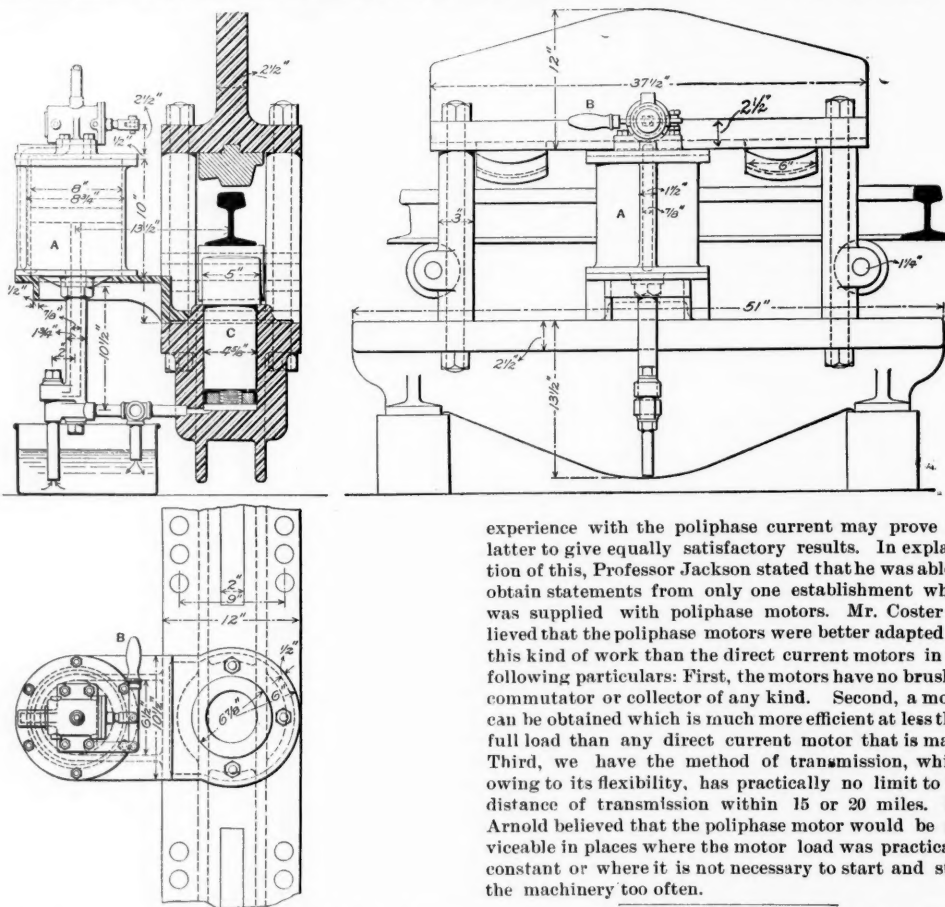


Fig. 34.—Pneumatic Attachment to Hydraulic Rail-Bender.

where cleanliness is important, the electrical transmission unquestionably offers the greater advantages.

The general summary is briefly as follows: First, in constructing new manufacturing plants the extra first cost of a complete system of electrical transmission for the works is very small compared with the annual saving effected by its means when its advantages are properly utilized. Second, in certain industries the advantages of electrical transmission outweigh the first cost in

experience with the polyphase current may prove the latter to give equally satisfactory results. In explanation of this, Professor Jackson stated that he was able to obtain statements from only one establishment which was supplied with polyphase motors. Mr. Coster believed that the polyphase motors were better adapted for this kind of work than the direct current motors in the following particulars: First, the motors have no brushes, commutator or collector of any kind. Second, a motor can be obtained which is much more efficient at less than full load than any direct current motor that is made. Third, we have the method of transmission, which, owing to its flexibility, has practically no limit to the distance of transmission within 15 or 20 miles. Mr. Arnold believed that the polyphase motor would be serviceable in places where the motor load was practically constant or where it is not necessary to start and stop the machinery too often.

Compressed Air at the Topeka Shops of the Atchison, Topeka & Santa Fe.

(CONCLUDED FROM PAGE 164.)

Car Shops and Yards.

Fig. 24 is a transfer table operated by rotary air engines that are geared by bevel gears and a worm wheel to one of the axles of the transfer table. The air is supplied by a hose that is carried on a reel attached to the transfer table. This reel is made to revolve as the table travels, by means of a chain and sprocket wheels, and



has a sufficient number of revolutions to keep the hose correctly played out. On the table is a windlass also operated by the air engines. This transfer table is an apt illustration of one of the numerous uses to which these rotary air engines are put. It is of course reversible and in operation is all that is desired.

Fig. 25 is a car wheel jack and device for loading the wheels on the cars that is exceedingly ingenious and

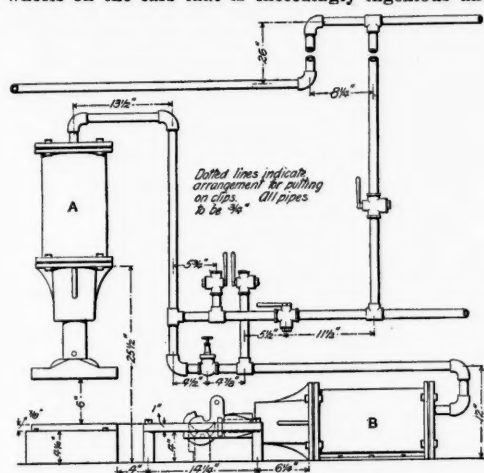


Fig. 33.—Arrangement for Putting on Air-Brake Hose.

useful. The jack consists of a cast-iron cylinder sunk in a bit between the rails of the track on which the wheels are to be loaded. Fitting into the top of the piston rod is a carrier which engages the axle on which the wheels are mounted. This carrier is of such a shape that, when the wheels are raised sufficiently, it catches the ends of the arms *A* of the loading device. As the wheels are further raised these arms slip beneath the axle and finally lift them clear of the carrier, permitting them to roll on the flat car. By this device accidents to the laborers loading in the usual manner with skids are entirely eliminated.

Fig. 26 is a 10-ft. radial crane used in loading and unloading material from cars. It has a capacity of 6 tons and it will be seen that the movement of the hoist along its track is also accomplished by air.

Fig. 27 is a pull down jack for removing draft timbers and sills from cars. Its construction and operation are too clearly shown to need explanation.

Figs. 28 and 29 are examples of jacks used in the freight repair yards and coach shops respectively. They differ somewhat in design owing to the different uses to which they are applied.

Fig. 30 is a small circular saw operated by a rotary air engine. The saw blade is 10½ in. in diameter and is attached directly to the shaft of the engine. It is covered on top by a casing in order to prevent accidents to the operator and is used to cut off the ends of new roofs of freight cars. By means of it a car roof can be cut off in five minutes, which is a great saving in time.

Fig. 31 is a spray painting machine for freight cars.

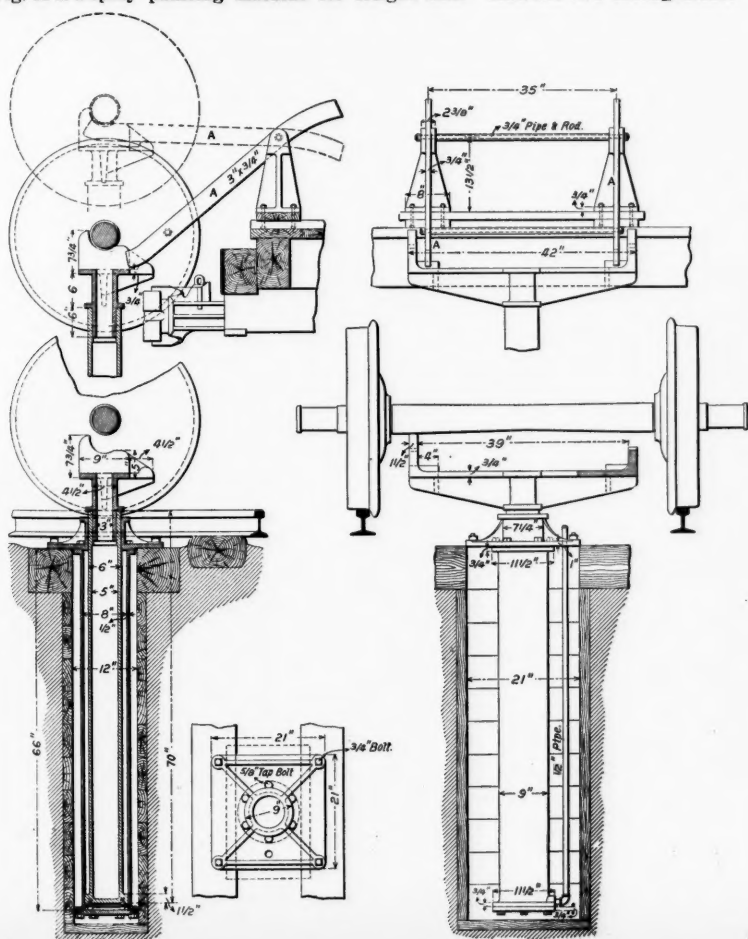


Fig. 25.—Pneumatic Car-Wheel Jack.

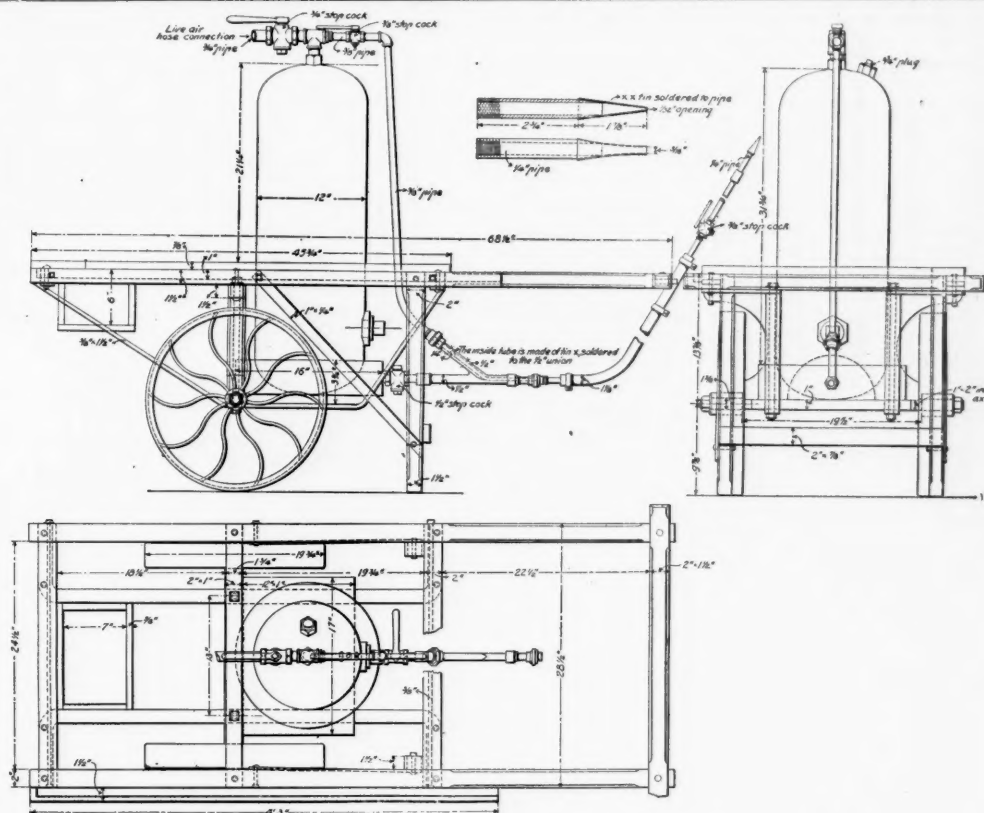


Fig. 31.—Spray Painting Machine for Freight Cars.

This consists of an air brake auxiliary reservoir mounted on a light two-wheel truck. The tank is filled with paint from the top, which is drawn off from the bottom through a  $\frac{1}{4}$ -in. pipe to an atomizer. Here the paint comes into contact with a stream of air from a pipe connected to the top of the reservoir. For the spray, the end of the delivery pipe is flattened. The flow of air and paint is regulated by cocks. One man only is required to handle the apparatus, and with it he primes and paints all the freight cars at these shops; 12 minutes only are required to paint a box car including the roof. In addition to the above there is also a pneumatic sand-papering machine, of which we have no illustration. The sand paper is fastened to a disk which is rapidly revolved by one small rotary air engine in a manner similar to the operation of the saw.

*Air Brake Department.*

In this department are used the two arrangements

illustrated by Figs. 32 and 33, the former for cutting off old air hose couplings, clips, etc., and the latter for putting on new ones. In both cases the ordinary freight air brake cylinder is used. In Fig. 32 the coupling to be cut off is held up against the stationary jaw of *A*, while the jaw *B* moved by the air cylinder cuts the hose from the coupling. The operation takes but a few seconds. Such couplings as can be used again are placed in a bin and the useless ones tossed out on the scrap heap. In Fig. 33 the hose is held by the cylinder *A* while the cylinder *B* presses on the coupling or clip.

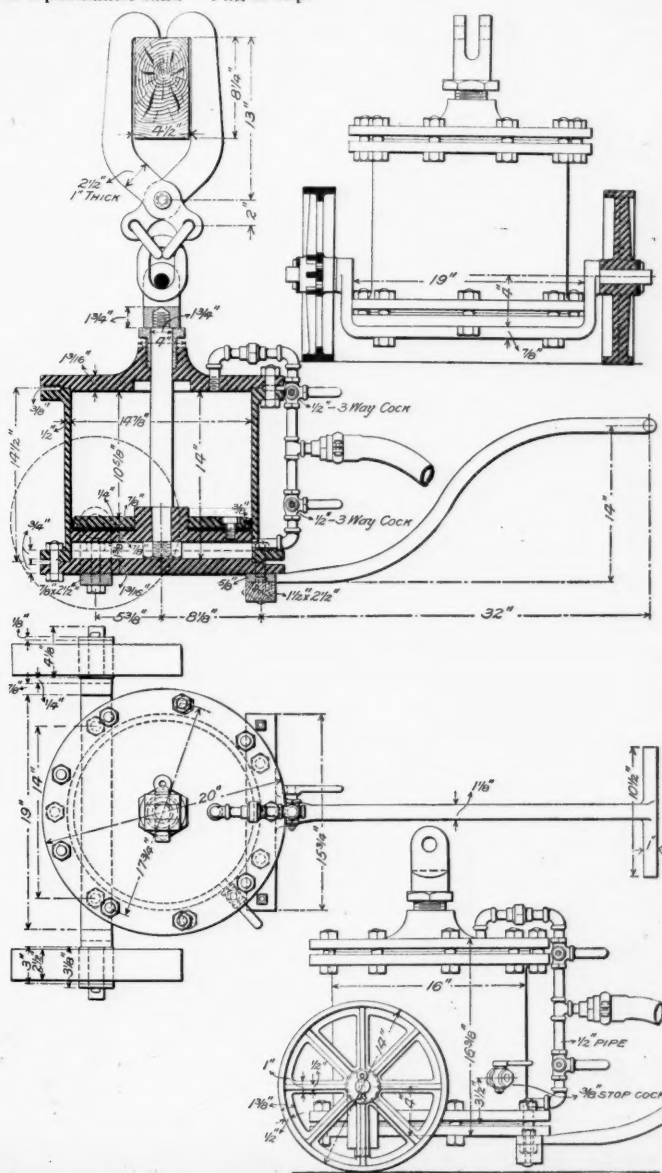


Fig. 27.—Draft-Timber Jack.

**Material Yard.**

In the material yard, some three-fourths of a mile away from the shops, is used the pneumatic attachment to the hydraulic rail bending and straightening machine. This is illustrated in Fig. 34, which shows how air is used to operate the pump for the hydraulic press. The piston in the air cylinder, A, is made to rise or fall by the air admitted through a movement of the handle B, and so pump the oil or water into the hydraulic cylinder, C. In this yard a Q & C rail saw is operated by one of the rotary air engines, as are also several drills.

The foregoing are the principal uses of compressed air in the Atchison, Topeka & Santa Fe shops at Topeka, and new devices are being frequently added to the already large collection of tools. We are indebted to the courtesy of Mr. John Player, Superintendent of Machinery; Mr. George W. Smith, Master Mechanic, and to Mr. A. M. Baird, Foreman of the boiler shop, for this information.

**The Trans-Missouri Decision.**

The decision of the United States Supreme Court in the case of the United States vs. the Trans-Missouri Freight Association, briefly reported last week, is very long, and in the following paragraphs we have attempted to condense it within readable compass. As the reader who wishes to make a minute study of the language of the decision will no doubt supply himself with a complete copy we omit the references to previous decisions.

The Trans-Missouri Freight Association, composed of the principal railroads west of Omaha and Kansas City, was organized March 15, 1889. Besides the usual provisions of freight agreements, the agreement of this association provided that on each road one person should be held personally responsible for rates and for attendance at meetings, and his vote at a meeting should be binding on the road; that five days' written notice, prior to monthly meetings, should be given of proposed reductions in rates, etc.; that a road might take independent action, in spite of the association, on ten days notice, and under certain conditions might do so without

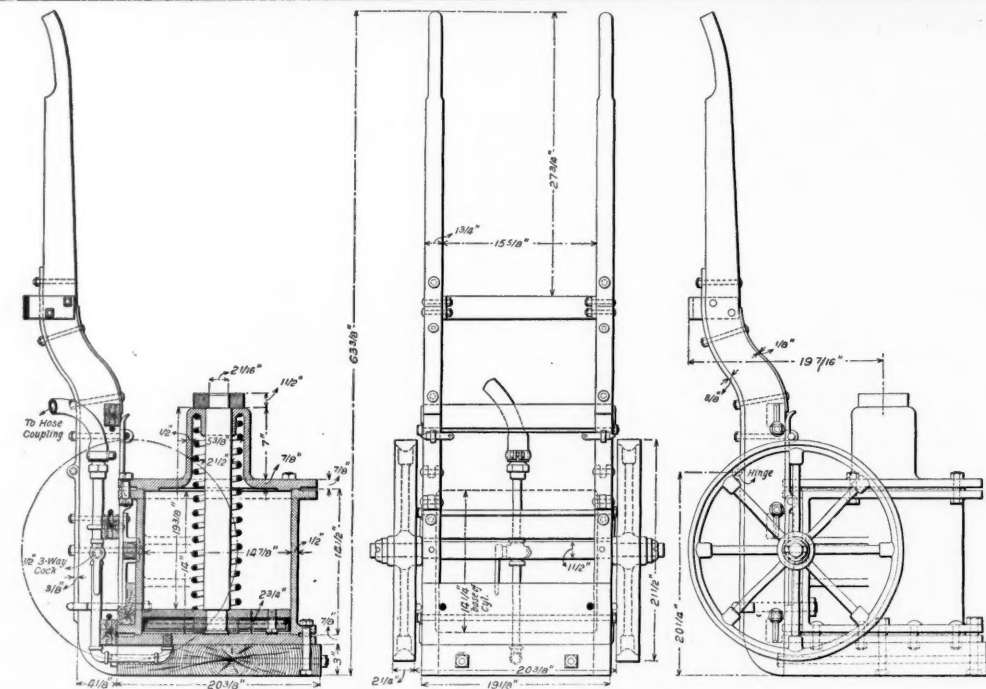


Fig. 28.—Pneumatic Jack in Freight Repair Yard.

ants should be restrained from continuing a like combination. The most important object of this litigation is to ascertain the legality of an agreement of this kind. The defendants take pains to show that the dissolution had no connection with the pendency of this suit, but they do not admit the illegality of the agreement. There is no evidence that they are not still working un-

tered, the appellate jurisdiction of this Court is not ousted by a simple dissolution of the association, effected subsequently to the entry of judgment in the suit. Private parties may settle their controversies at any time and a litigant's rights may terminate during the pendency of a suit, but in this case there has been no extinguishment of the rights of the public.

It was claimed that the suit did not involve \$1,000, and so could not come before the Supreme Court. But the parties have agreed that the interstate business of the roads at competing points, for a single day, would amount to more than \$1,000, and this being so, it is held that the case properly comes before the Supreme Court. Each company is interested in maintaining the agreement to the same extent as all the other companies, and the government represents the interests of the whole public.

The language of the act includes every contract, combination in the form of trust or otherwise, or conspiracy in restraint of trade or commerce among the several states or with foreign nations. So far as the very terms of the statute go, they apply to any contract of the nature described. Railroad companies are instruments of commerce and their business is commerce itself. The sixth section does not forfeit the property of the railroad companies for violating the law (which penalty is imposed for certain specified violations), but it is not necessary in order to make the act apply to railroads to provide for the seizure of locomotives and cars. There is some justice in forfeiting merchandise made or sold in violation of the act, but the Court sees none in forfeiting cars. In the case of a simple transportation the carrier would be guilty of no crime. Seizure might cause great confusion to other business. The penalties provided by the law are sufficient.

But it is maintained that the agreement is authorized by the Interstate Commerce Act, and that the language of the trust act is not sufficiently plain to indicate that it was intended to repeal those provisions of the commerce act which permit the agreement; and it is said that if Congress had intended to affect railroads it

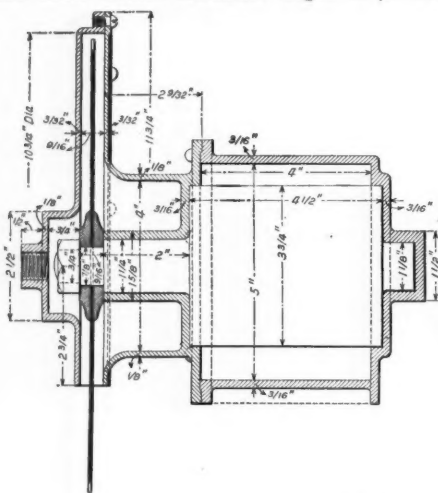


Fig. 30.—Pneumatic Motor and Saw.

notice, though if the Chairman should decide that the change made was unnecessary the road must withdraw the rate, unless at the next meeting the association should decide by a two-thirds vote to sustain the road. The managers could impose fines by a majority vote, not exceeding \$100 each. Any road could withdraw on 30 days' notice.

The suit was filed Jan. 6, 1892, alleging that the roads had agreed to unjustly and oppressively increase and augment rates, to counteract the effect of free competition; that the agreement evidenced an intent to monopolize trade and was a conspiracy. It was charged that since rates had been fixed under the agreement the roads had refused to base their rates upon proper considerations of cost of construction, operation and maintenance.

The defendants denied that the roads were subject to the anti-trust law of July 2, 1890; denied that they were the only roads in the territory under consideration or that they had been dissatisfied with the pre-association rates; denied any intent to increase rates, any limitation of competition, any arbitrary fixing of rates, any increase of rates, any intent to create a monopoly, and all illegality or conspiracy. They alleged that the agreement maintained reasonable rates; that it was filed with the Interstate Commerce Commission, as required by law; that it provided for a reduction of rates when occasion required, each line having the power to reduce its own rates, even against the decision of the association; they denied that they had ever refused to establish reasonable rates. They denied all oppression and injury, and alleged that the agreement was of benefit to shippers.

The Circuit Court and the Circuit Court of Appeals dismissed the complaint and appeal was taken to the Supreme Court.

Mr. Justice Peckham delivered the opinion of the Court. The first ground of appeal was that the association was dissolved after the suit was begun. This argument is not accepted. The bill asked not only for the dissolution of the association, but also that the defend-

der an agreement of the same general nature. Generally, equity does not interfere simply to restrain a possible future violation of law. Yet where parties have entered into an illegal agreement and are acting under it, and there is no adequate remedy at law, and the jurisdiction of the Court has attached by the filing of a bill to restrain such or any like action under a similar agreement, and a trial has been had and judgment en-

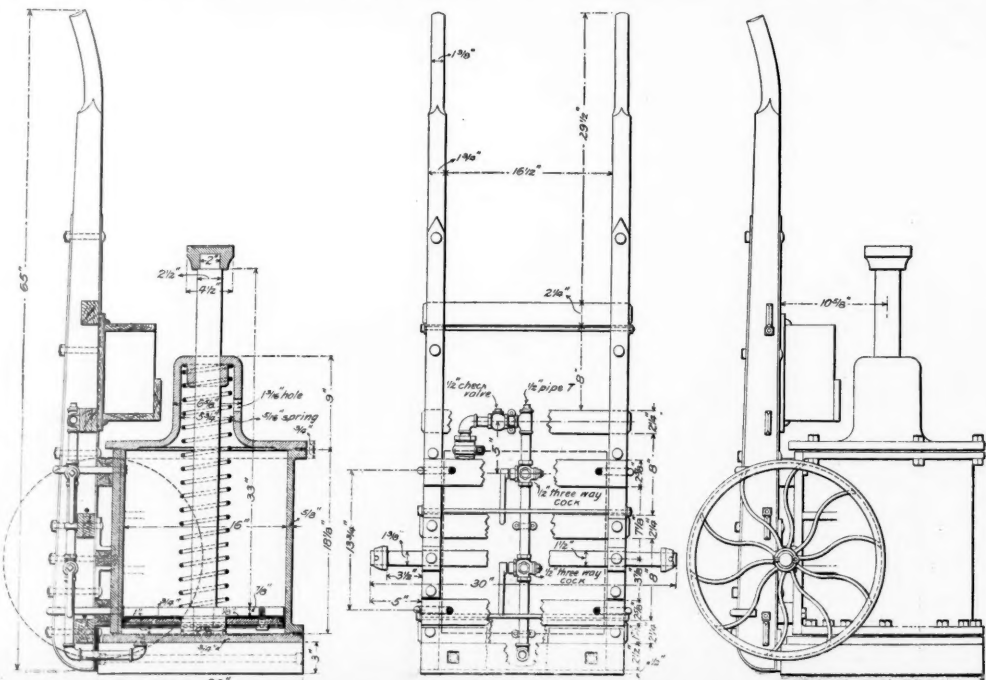


Fig. 29.—Pneumatic Jack in Coach Shop.



would have specifically amended the commerce law in passing the trust act. The Court holds, however, that the commerce act does not authorize an agreement of this nature, though it may not in terms prohibit. The act was not directed to the securing of uniformity of rates to be charged by competing companies, nor was there any provision therein as to a maximum or mini-

aimed at the prevention of that kind of agreement made in restraint of trade, which may exist in all companies, which is substantially of the same nature wherever found, and which tends very much toward the same results whether put in practice by a trading and manufacturing or by a railroad company? It is true the results of trusts, or combinations of that nature, may

to the sole will of one powerful combination of capital.

It is appropriate to subject manufacturers to rules different from those applied to railroads, but when the evil to be remedied is similar in both cases, no reason is apparent why similar rules should not apply.

The language of the statute is not uncertain and the Court thinks, after a careful examination, that the statute covers, and was intended to cover, common carriers by railroad.

Assuming that the act applies to railroads, does its language apply only to contracts which effect unreasonable restraint? The Court is asked to regard the title of the act as indicating its purpose to include only those contracts which were unlawful at common law, but which require the sanction of a federal statute in order to be dealt with in a federal court. It is argued that when terms, which are known to be common law, are used in a federal statute those terms are to be given the same meaning that they received at common law, and that when the language of the title is "to protect trade and commerce against unlawful restraints and monopolies," it means those restraints and monopolies which the common law regarded as unlawful, and which were to be prohibited by the federal statute. This rule is not approved. The Court holds that the act includes those restraints specified in the body of the statute. It is to the statute itself that resort must be had to learn the meaning thereof. The limited signification urged by defendant cannot be applied to the language of this law.

Contracts in restraint of trade have been known and spoken of for hundreds of years both in England and this country, and the term includes all kinds of those contracts which in fact restrain or may restrain trade. Some of such contracts have been held void and unenforceable in the courts by reason of their restraint being unreasonable, while others have been held valid because they were not of that nature. A contract may be in restraint of trade and still be valid at common law. Although valid, it is nevertheless a contract in restraint of trade, and would be so described either at common law or elsewhere. By the simple use of the term contract in restraint of trade, all contracts of that nature, whether valid or otherwise, would be included, and not alone that kind of contract which was invalid and unenforceable as being in unreasonable restraint of trade.

The Court below, assuming that the statute did not mean what its plain language imported, examined the general rules which guide courts in considering contracts alleged to be against public policy. The decision here quotes from these utterances of the lower Court and discusses the law applicable to the sale of a business with a stipulation that the vendor shall not enter the same business for a certain time. Where such stipulation is a mere accompaniment, the contract might not come under such a law as the trust act, but "we cannot see how the statute can be limited, as it has been by the courts below, without reading into its text an exception which alters the natural meaning of the language used, and that, too, upon a most material point, and where no sufficient reason is shown for believing that such alteration would make the statute more in accord with the intent of the law-making body that enacted it."

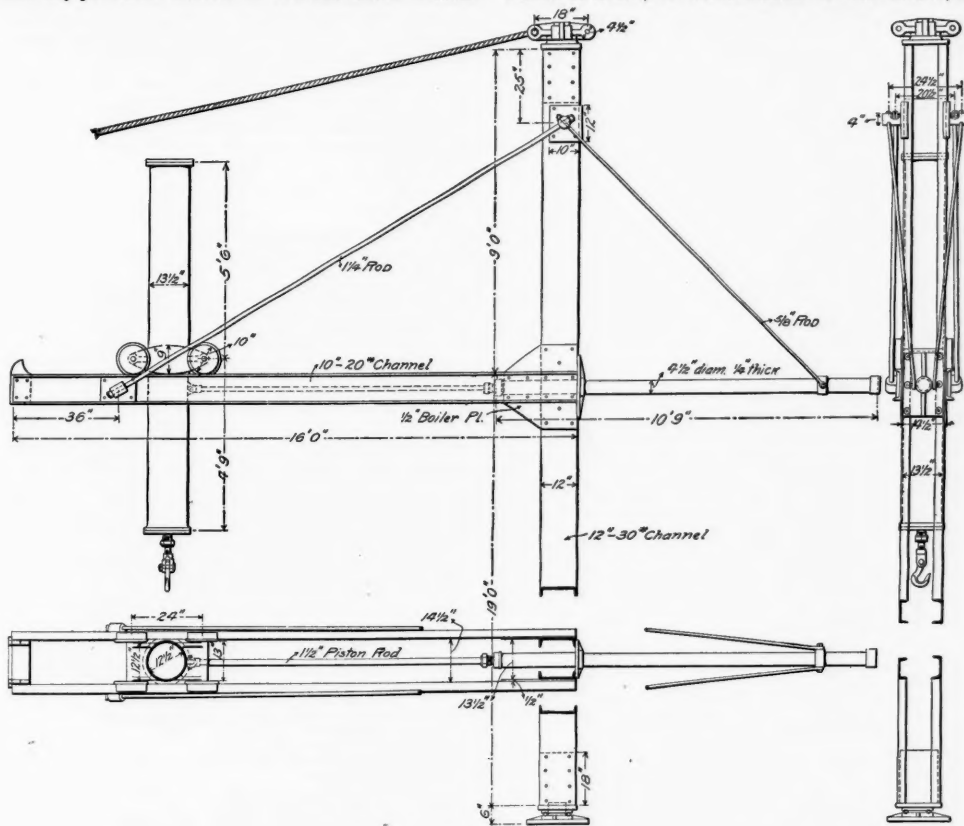


Fig. 26.—Ten-Font Radial Crane.

num of rates. Competing and non-connecting roads are not authorized by this statute to make an agreement like this one. Both statutes may stand, as neither is inconsistent with the other. Although the commerce statute may be described as a general code for the regulation and government of railroads upon the subjects treated of therein, it cannot be contended that it furnishes a complete and perfect set of regulations which are to govern them in all cases, and that any subsequent act in relation to them must, when passed, in effect, amend or repeal some provision of that statute. The statute does not cover all cases concerning transportation by railroad and all contracts relating thereto. It does not purport to cover such an extensive field.

It is urged that the debates in Congress show that the trust act does not include railroads, but these debates show that various views were held by the members of both houses of Congress. A proposition to include railroads was proposed, but rejected, and it was before committees several times. One committee report stated that railroads were already covered by the bill, as it originally stood and as it was finally passed, and it cannot be said that a majority of both houses did not agree with this view. Debates in Congress are not an appropriate source of information for learning the meaning of a law. Some members who did not speak may not have agreed with those who did. A study of the history of the times shows nothing to indicate that railroads were not intended to be included.

It is said Congress simply aimed at the big commercial trusts, but there is no evidence of this, and those trusts were not the only associations controlling a great combination of capital which had caused complaint. There were many and loud complaints from some portions of the public regarding the railroads and the prices they were charging, and it was alleged that the prices for the transportation of persons and articles of commerce were unduly and improperly enhanced by combinations among the different roads.

It is said that the Court ought to limit the meaning of the words of the statute because of the fundamental differences between railroads and other business. The trader or manufacturer carries on an entirely private business, and can sell to whom he pleases; he may charge different prices for the same article to different individuals; he may charge as much as he can get for the article in which he deals, whether the price be reasonable or unreasonable; he may make such discrimination in his business as he chooses, and he may cease to do any business whenever his choice lies in that direction; while, on the contrary, a railroad company must transport all persons and property that come to it, and it must do so at the same price for the same service, and the price must be reasonable, and it cannot at its will discontinue its business.

Many of the claims on this point may be well founded, while at the same time the conclusion drawn need not be conceded. The very fact of the public character of a railroad would, itself, seem to call for special care by the legislature in regard to its conduct. Why should not a railroad company be included in general legislation

be different in different kinds of corporations, and yet they all have an essential similarity, and have been induced by motives of individual or corporate aggrandizement as against the public interest.

Judge Peckham here discusses the general effect of trusts and the similar effects produced in commercial life by inventions. Great industrial changes often throw men out of work and even produce ruin. This is a misfortune in many directions, but it is inevitable. When, however, a combination of capital, made for the very purpose of controlling the market, drives small manufacturers or merchants out of business the case is very different. It is not for the real prosperity of any country that such changes should occur which result in transferring an independent business man, the head of his

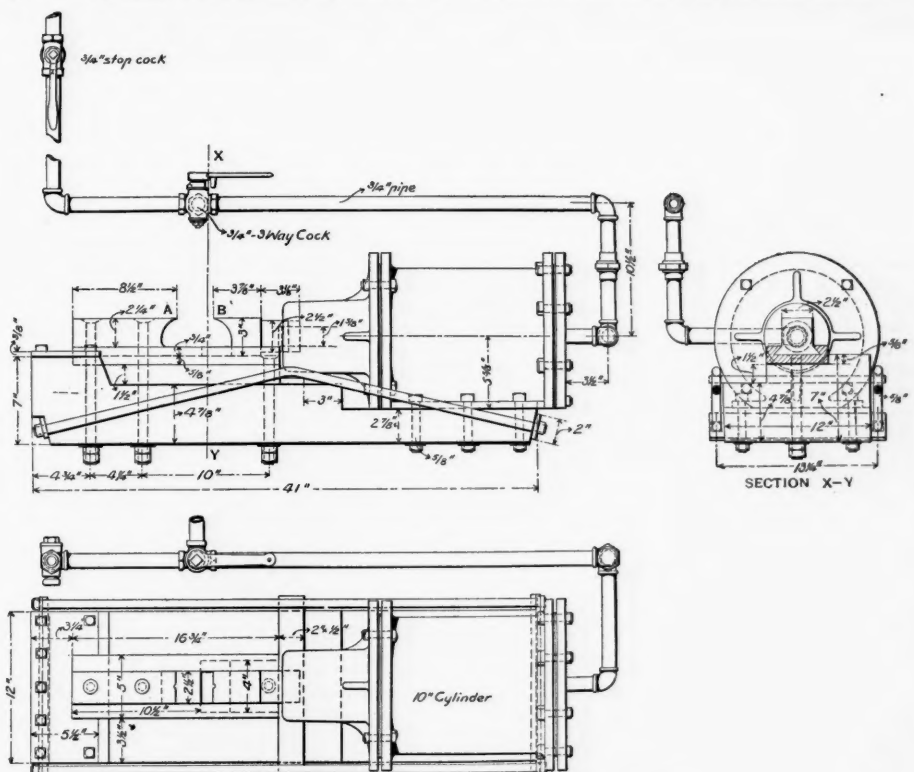


Fig. 32.—Device for Removing Old Air-brake Hose.

establishment, small though it might be, into a mere servant or agent of a corporation for selling the commodities which he once manufactured or dealt in, having no voice in shaping the business policy of the company and bound to obey orders issued by others. Nor is it for the substantial interests of the country that any one commodity should be within the sole power and subject

Defendants argue at great length on the peculiarities of railroad operation and competition. A railroad must transport all property and do business even without profit rather than stop its trains; its property cannot be used for any other purpose; competition leads to insolvency; a receiver works in the interest of creditors and not of owners; a receiver competing with a solvent road ruins

the latter, without benefit to his own road, etc. It is claimed that competition runs to excess, necessarily from the nature of the case; that each company will seek business to the extent of its power, and will underbid its rival in order to get the business, and such underbidding will act and react upon each company until the prices are so reduced as to make it impossible to prosper or live under them; that it is too much to ask of human nature for one company to insist upon charges sufficiently high to afford a reasonable compensation, and while doing so to see its patrons leave for rival roads who are obtaining its business by offering less rates for doing it than can be afforded and a fair profit obtained therefrom. Sooner than experience ruin from mere inanition, efforts will be made in the direction of meeting the underbidding of its rival until both shall end in ruin. The only refuge, it is said, from this wretched end lies in the power of competing roads agreeing among themselves to keep up prices for transportation to such sums as shall be reasonable in themselves, so that companies may be allowed to save themselves from themselves, and to agree not to attack each other, but to keep up reasonable and living rates for the services performed.

These arguments, it must be confessed, are forcible, but there is another side to the question. If only unreasonable contracts are to be prohibited, what is the basis of reasonableness? Must the railroad earn a fair dividend? If so, what is a fair dividend? Or, shall we judge by the amount needed to replace the railroad, or by the cost of carriage? If the latter, shall we include in its contributions to a sinking fund to renew cars, etc.? Or, shall we judge by the rates on other roads? If we do this, other roads might make a combination to maintain an abnormal basis. Even after the standard is determined, there is an infinite variety of facts to be considered, and no aggrieved shipper would dare to complain of a road, hoping to prove its rates unreasonable. To say, therefore, that the act excludes agreements which are not in unreasonable restraint of trade, and which tend simply to keep up reasonable rates for transportation, is substantially to leave the question of reasonableness to the companies themselves.

The first duty of a railroad is to the public. This is even higher than the duty to earn large dividends. It may well be doubted, to say the least, whether any contract which imposes any restraint upon its business would not be prejudicial to the public interest. The unfavorable results described by defendants, if the law is enforced, are by no means admitted with unanimity. On the contrary, they are earnestly and warmly denied on the part of the public and by those who assume to defend its interests both in and out of Congress. Competition, they urge, is a necessity for the purpose of securing in the end just and proper rates.

The plaintiffs need not prove that by common law all agreements among competing railroads to maintain reasonable rates are in restraint of trade. In the case of the *Mogul Steamship Co. vs. McGregor* (21 Q. B. D., 544, 598), there was an agreement for lowering rates of transportation, and it was entered into for the purpose of driving out of trade rival steamships in order that thereafter the rates might be advanced. The English courts held that the agreement was not a conspiracy, and that it was valid, although the result aimed at was to drive a rival out of the field, because so long as the injury to such rival was not the sole reason for the agreement, but self-interest the predominating motive, there was nothing wrong in law with an agreement of that kind. The provisions of the Interstate Commerce Act relating to reasonable rates, discriminations, etc., do not authorize such an agreement as this, nor do they authorize any other agreements which would be inconsistent with the provisions of the act. The general reasons for holding agreements of this nature to be invalid even at common law on the part of railroad companies are quite strong, if not entirely conclusive.

It is fair to assume that Congress had in mind the difficulty of proving the unreasonableness of a rate and therefore deliberately decided to prohibit all agreements, reasonable or otherwise.

The decision here quotes from the dissenting opinion of Judge Shiras on this case in the lower court. Assuming that a railroad is, as regards most of its business, a monopoly, Judge Shiras holds that all rate contracts between railroads affect the public interest, and therefore ought primarily to inure to the benefit of the community. Judge Shiras says that although the Interstate Commerce Commission has described the evils of rate wars and the advantages of concert of action, it has not definitely approved traffic agreements. He says:

"I fail to perceive the force of the argument that because railway companies through their own action cause evils to themselves and the public by sudden changes or reduction in tariff rates, they must be permitted to deprive the community of the benefit of competition in securing reasonable rates for the transportation of the products of the country. Competition, free and unrestricted, is the general rule which governs all the ordinary business pursuits and transactions of life. Evils, as well as benefits, result therefrom. In the fierce heat of competition the stronger competitor may crush out the weaker; fluctuations in prices may be caused that result in wreck and disaster; yet, balancing the benefits as against the evils, the law of competition remains as a controlling element in the business world. That free and unrestricted competition in the matter of railroad charges may be productive of evils does not militate against the fact that such is the law now governing the subject. No law can be enacted nor system be devised for the control of human affairs that in its enforcement does not produce some evil results, no matter how beneficial its general purpose may be. There are benefits and there are evils which result from the operation of

the law of free competition between railway companies. The time may come when the companies will be relieved from the operation of this law, but they cannot, by combination and agreements among themselves, bring about this change."

Possibly defendants have exaggerated the probable evil results of free competition. Free competition has existed in the past, and it is not at all clear that the general result has been other than beneficial to the whole public, and not in the long run detrimental to the prosperity of the roads. It is a matter of common knowledge that agreements as to rates have been continually made of late years, and that complaints of each company in regard to the violation of such agreements by its rivals have been frequent and persistent. Rate wars go on notwithstanding any agreement to the contrary, and the struggle for business among the competing roads keeps on, and in the nature of things will keep on.

The Interstate Commerce Commission has shown that "agreements between railroad companies which from time to time they have entered into with a view to prevent such occurrences have never been found effectual, and for the very sufficient reason that the mental reservations in forming them have been quite as numerous and more influential than the written stipulations." It would seem true, therefore, that there is no guaranty of financial health to be found in entering into agreements for the maintenance of rates, nor is financial ruin or insolvency the necessary result of their absence.

The fact that a railroad has the right to charge reasonable rates does not give it the right to combine with a competitor to maintain such rates.

Summing up, Justice Peckham says:

"We are, therefore, asked to hold that the act of Congress, excepts contracts which are not in unreasonable restraint of trade, and which only keep rates up to a reasonable price, notwithstanding the language of the act makes no such exception. In other words, we are asked to read into the act by way of judicial legislation an exception that is not placed there by the lawmaking branch of the government, and this is to be done upon the theory that the impolicy of such legislation is so clear that it cannot be supposed Congress intended the natural import of the language it used. This we cannot and ought not to do. That impolicy is not so clear, nor are the reasons for the exception so potent as to permit us to interpolate an exception into the language of the act, and to thus materially alter its meaning and effect. It may be that the policy evidenced by the passage of the act itself, will, if carried out, result in disaster to the roads and in failure to secure the advantages sought from such legislation. Whether that will be the result or not we do not know and cannot predict. The considerations are, however, not for us. If the act ought to read as contended for by defendants, Congress is the body to amend it, and not this Court, by a process of judicial legislation wholly unjustifiable. Large numbers do not agree that the view taken by defendants is sound or true in substance, and Congress may, and very probably did, share in that belief in passing the act. The public policy of the government is to be found in its statutes, and when they have not directly spoken, then in the decisions of the courts and the constant practice of the government officials; but when the law-making power speaks upon a particular subject, over which it has constitutional power to legislate, public policy in such a case is what the statute enacts. If the law prohibit any contract or combination in restraint of trade or commerce, a contract or combination made in violation of such law is void, whatever may have been theretofore decided by the courts to have been the public policy of the country on that subject."

Therefore the anti-trust act applies to railroads.

The legal effect of the agreement cannot be altered by alleging good intention. Neither is the intent alleged by the government necessary to be proved. The question is one of law in regard to the meaning and effect of the agreement itself, namely: Does the agreement restrain trade or commerce in any way so as to be a violation of the act? We have no doubt that it does. The agreement on its face recites that it is entered into "for the purpose of mutual protection by establishing and maintaining reasonable rates, rules, and regulations on all freight traffic, both through and local." To that end the association is formed and a body created which is to adopt rates which, when agreed to, are to be the governing rates for all the companies, and a violation of which subjects the defaulting company to the payment of a penalty, and although the parties have a right to withdraw from the agreement on giving 30 days' notice of a desire so to do, yet while in force and assuming it to be lived up to, there can be no doubt that its direct, immediate and necessary effect is to put a restraint upon trade or commerce as described in the act. Therefore, the government need not prove that the purpose was to restrain trade or to maintain rates above what was reasonable. The necessary effect of the agreement is to restrain trade or commerce, no matter what the intent was on the part of those who signed it.

This decision does not give to the law retroactive effect. The agreement was made before the law was passed, but it is a continuing agreement, and continuation after it is declared illegal becomes a violation of the act.

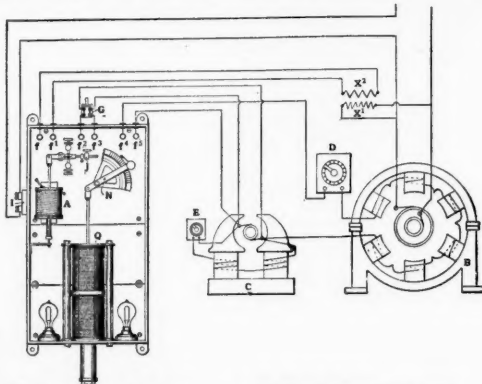
The claim that the government has no standing in court is denied. The fourth section of the act gives the government full power to bring suit, and Congress, having control of interstate commerce, was competent to confer this power.

#### The Chapman Voltage Regulator.

The object of a voltage regulator is simply to keep incandescent electric lights steady when the load on the generator is suddenly altered, and also to increase the life of the lamp. The first Chapman regulator contained but one coil, the regulation being effected in the same manner so far as the principle is concerned, as the im-

proved form here described. The regulator acts promptly, being limited in quickness of action only by the ability of the generator which it is regulating to respond to a change on a field rheostat.

The device is essentially a field rheostat, the moving of the arm being accomplished by the action of a working solenoid. The action of the working solenoid is determined by that of an auxiliary solenoid, A, which operates a set of contacts that control the admission of current to the sections of the working solenoid. The working solenoid, Q, is differentially wound and is composed of four distinct coils, two of which have a small continuous current flowing through them, in mechanical opposition to each other; the contacts close the circuit of one or the other of remaining coils, and so neutralize the action of one of the continuously-acting coils. This manner of connecting secures a rise of magnetism in the iron core of the solenoid whenever a break occurs at the contacts, and so avoids any injurious sparking at the contacts that would naturally occur by



The Chapman Alternating-Current Voltage Regulator.

the magnetic discharge of the core. This arrangement completely neutralizes the induction spark.

The entire work of the auxiliary solenoid is to move a lever arm, with the attached contact through a short space of about  $\frac{1}{2}$  in., and a very slight change of voltage is sufficient to do this. The Chapman voltage regulator enables the old-style, alternating-current generators having no compound coils to do good work, and some machines that have been discarded as out of date will be made serviceable by using this regulator. The operation of the large working solenoid requires 60 to 70 watts, and the rheostatic part of the device takes the same current as the shunt winding of the generator, which is only a very small percentage of the output of the machine. The regulators are wound for both alternating and direct current generators.

#### Dissenting Opinion in Trans-Missouri Case.

The dissenting opinion of Mr. Justice White in the case of the *United States vs. Trans-Missouri Freight Association* (decision of the Court reported elsewhere in this paper) is more than half as long as the majority opinion. It is concurred in by Justices Field, Gray and Shiras.

Justice White at the outset assumes it to be conceded by all that only such contracts as unreasonably restrain trade violate the general law, and that the *Trans-Missouri* contract is reasonable and therefore not unlawful, if the general principles of law are to be applied to it.

It is necessary to consider the full import of the conclusion reached by the majority of the Court.

"As it is conceded that the contract does not unreasonably restrain trade, and that if it does not so unreasonably restrain, it is valid under the general law, the decision substantially is that the act of Congress is a departure from the general principles of law, and by its terms destroys the right of individuals or corporations to enter into very many reasonable contracts. But this proposition, I submit, is tantamount to an assertion that the act of Congress is itself unreasonable. The question, then, is, Is the act of Congress to be so interpreted as to give it a reasonable meaning, or is it to be construed as being unreasonable and as violative of the elementary principles of justice?"

Justice Peckham in the majority decision says in effect that as the law says "every contract" the courts have no power to substitute the word "some" for the word "every." Is this proposition well founded? A brief consideration of the history and development of the law on the subject of contracts in restraint of trade will demonstrate that only unreasonable contracts are covered by the law. The opinion here refers to early cases, one as far back as the time of Henry V. The distinction between general and partial restraints was first decided in England in 1711 (*Mitchell vs. Reynolds*, 1 P. Wms. 181). The correctness of this decision was, however, questioned in some subsequent cases, and the matter was finally set at rest by the House of Lords in 1894 (*Nordenfelt vs. Nordenfelt Guns & Ammunition Co.*, App. Cas. p. 535). In that case it was held that the distinction between partial and general restraint was not a sufficient criterion. The decision must rest upon reasonableness. If a contract was reasonable, it was not in restraint of trade; if unreasonable, it was. The American



courts have conformed to this decision and an important American decision was that of the New York Court of Appeals in the case of *Matthews vs. Associated Press* (136 N. Y. 333). In this case it was held that, for instance "a business partnership could provide that none of its members should attend to any business other than that of the partnership, and that each partner who came in must agree not to do any other business, and must give up all such business as he had theretofore done. Such an agreement would not be in restraint of trade, although its direct effect might be to restrain to some extent the trade which had been done."

The Supreme Court of the United States has decided questions in the same way, as, for instance, *Oregon S. N. Co. vs. Winsor* (20 Wall. 64, 68); *Gibbs vs. B. Gas Co.* (130 U. S., 396, 400). Justice White here refers to several opinions of state courts in New York, New Jersey, Minnesota and Wisconsin.

This view, that such contracts must be judged by their reasonableness, has gradually developed, as it was seen that a rigid rule would destroy freedom of contract and prevent all trade. The majority opinion admits that a contract which is merely collateral may be an exception, but this one admission is enough to vitiate the rule. A collateral contract may contain provisions which make it unreasonable.

The title of the anti-Trust act says that it is to protect commerce against *unlawful* restraints. While it is true that the title cannot be used to destroy the plain import of the language in the body of the act, yet when a literal interpretation will work out injury, the title may be looked to for aid in construction. Several cases are cited to sustain this point.

"Restraint of trade" is a technical phrase and has long had a well-settled meaning. It is not to be presumed that the anti-trust act intended to give a new significance to the words. The Court must not give such a phrase a new meaning, especially where the statute in which it is used creates a crime and gives no specific definition of the crime created.

"If these obvious rules of interpretation be applied," says Justice White, "it seems to me they render it impossible to construe the words 'every restraint of trade,' used in 'the act, in any other sense than as excluding reasonable contracts, as the fact that such contracts were not considered to be within the rule of contracts in restraint of trade was thoroughly established both in England and in this country at the time the act was adopted. It is, I submit, not to be doubted that the interpretation of the words 'every contract in restraint of trade,' so as to embrace within its purview every contract, however reasonable, would certainly work an enormous injustice and operate to the undue restraint of the liberties of the citizen. But there is no canon of interpretation which requires that the letter be followed when by so doing an unreasonable result is accomplished. On the contrary, the rule is the other way, and exacts that the spirit which vivifies, and not the letter which killeth, is the proper guide by which to correctly interpret a statute."

Mr. Justice White here cites a number of cases in which the literal language of the statute has been disregarded in order to restrict the operation of a law within reason. The principal one is *Lau Ow Bew vs. United States* (144 U. S. 47) by Chief Justice Fuller. The supreme rule is that the intention of the law must be carried out. If the courts abrogate the rule of reason, the liberty of the citizen, no longer secured, becomes subject, when questioned, to the mere caprice of judicial authority. "Thus, a law in favor of freedom of contract, it seems to me, is so interpreted as to gravely impair that freedom. Progress and not reaction was the purpose of the act of Congress. The construction now given the act disregards the whole current of judicial authority and tests the right to contract by the conceptions of that right entertained at the time of Henry V. instead of by the light of reason and the necessity of modern society. To do this violates, as I see it, the plainest conception of public policy; for, as said by Sir G. Jessel, master of the rolls, in *Printing Company vs. Sampson* (L. R. 19 Eq. 465), 'it there is one thing which more than another public policy requires it is that men of full age and competent understanding shall have the utmost liberty of contracting, and their contracts when entered into freely and voluntarily shall be held sacred, and shall be enforced by courts of justice.'"

The construction given by the majority strikes down the interest of the many to the advantage of the few. In the case of *Debs* (64 Fed. Rep., 724, 743) the Supreme Court held that the anti-Trust law applies to combinations among workmen, and the present decision now makes it cover *all* such combinations, however peaceable and of however laudable intention, thus frustrating the plain purpose of Congress.

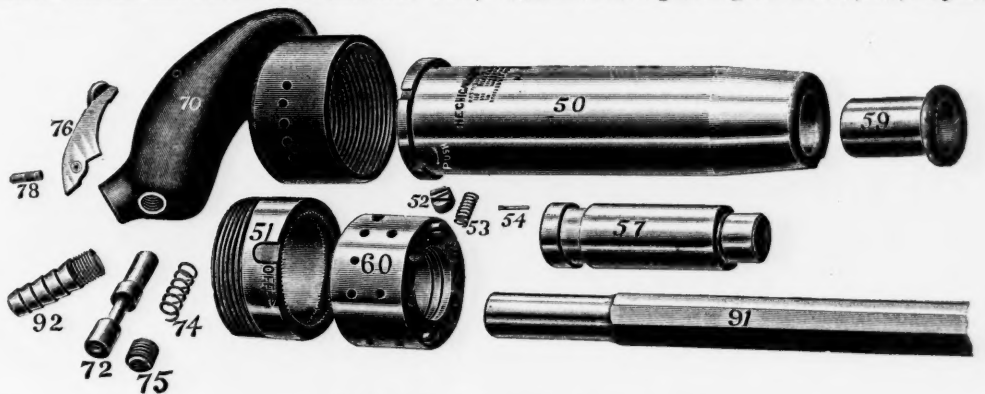
But conceding, for the sake of argument, that "every contract," etc., is covered by the anti-Trust law, was the act intended to apply to agreements between carriers? Justice White takes the view that Congress did not intend that the act should apply to railroads (Justice Peckham held that it was impossible to decide) and goes into a long argument to show that the Interstate Commerce act recognized contracts between railroads, and the anti-Trust law did not repeal that act. He quotes from the early reports of the Interstate Commerce Commission to show the beneficent purposes and results of traffic agreements, and that the Commissioners did not disapprove them. The prohibition of pooling by the Interstate Commerce law was enacted in such a way as to show that Congress did not intend to prohibit contracts

other than pools. The contemporaneous construction of the provisions of the Interstate Commerce law by the Interstate Commerce Commissioners is entitled to great weight, and Congress amended the law, in the light of these views of the Commission, without repudiating the Commission's construction.

"It is therefore not to be denied that the agreement between the carriers, the validity of which is here drawn in question, seeking to secure uniform classification and to prevent the undercutting of the published rates, even though such agreements be made with competing as well as joint lines, is in accord with the plain text of the Interstate Commerce act, and is in harmony with the views of the purposes of that law contemporaneously expressed to Congress by the body immediately charged with its administration and tacitly approved by Congress."

"The Interstate Commerce act was intended by Congress to inaugurate a new policy. Two systems were necessarily presented—the one a prohibition against the exaction of all unreasonable rates and subject to this restriction, allowing the hourly and daily play of untrammelled competition, resulting in inequality and discrimination; the other imposing a like duty as to reasonable rates, and while allowing competition subject to this limitation, preventing the injurious consequences arising from a constant and daily change of rates between connecting or competing lines, thus avoiding discrimination and preference as to persons and places. The second of these systems is plainly the one embodied in the Interstate Commerce act. To hold, then, the contract under consideration to be invalid when it simply provides for uniform classification, and seeks to prevent secret or sudden changes in the published rates, would be to avoid a contract covered by the law and embodied in its policy, while the avowed purpose of the contract in question embraced only the foregoing objects it cannot be said that its ulterior intent was to bring about results in conflict with the Interstate Commerce law. The answers to the bill of complaint specially denied the allegations as to the improper motives of the parties to the contract, and also expressly averred their lawful and innocent intention. As the case was heard upon bill and answer, improper motives can not, therefore, be imputed. Indeed, the opinion of the Court sustains this view."

"Nor do I think that the danger of these evil consequences is avoided by the statement that if the contract be annulled these dangers will not arise, because experience shows that contracts such as that here in question, when entered into by railroads, are never observed, and therefore it is just as though the contract did not exist. How, may I ask, can judicial notice be taken of this fact, when it is said that judicial notice cannot be taken of the fact that there are such contracts? How,



The New Boyer Pneumatic Hammer.

moreover, may I ask, can it be said on one branch of the case that the contract, although reasonable, must be avoided, because it is a contract in restraint of trade, and then on the other branch declare that contracts of that character never do restrain trade because they are never carried out between the parties who enter into them?

"There is another contention which, I submit, is also unsound, that is the suggestion that it is impossible to say that there can be such a thing as a reasonable contract between railroads seeking to avoid sudden or secret changes in reasonable rates because the question of railroad rates is so complex and is involved in so much difficulty, that to say that a rate is reasonable is equivalent to saying that it must be fixed by the railroads themselves, as no mind outside of the officials of the particular roads can determine whether a rate is reasonable or not. But this proposition absolutely conflicts with the methods of dealing with railroad rates adopted in England and expressly put in force by Congress in the Interstate Commerce act and by many of the states of the Union. For years, the rule in England was reasonable rates enforced by judicial power, and subsequently by enactment securing such reasonable rates by administrative authority. The Interstate Commerce act especially provides for reasonable rates, and vests primarily in the Commission, and then in the courts the power to enforce the provision, and like machinery is provided in many of the states. Will it be said that Congress and other legislative bodies have provided for reasonable rates and created the machinery to enforce them, when whether rates are reasonable or not is impossible of ascertainment? If this proposition be correct, what, may I ask, becomes of the judgment of this Court in *C. N. O. & T. P. v. I. C. Com.* (162 U. S., 184), where it is held that the order of the commission fixing certain rates charged by a railroad to be unreasonable was correct?"

"In conclusion, I notice briefly the proposition that though it be admitted that contracts, when made by individuals or private corporations, when reasonable, will not be considered as in restraint of trade, yet such is not the case as to public corporations, because any contract made by them in any measure in restraint of trade, even when reasonable, is presumptively injurious to the public interests, and therefore invalid. The fallacy in this proposition consists in overlooking the distinction between acts of a public corporation which are *ultra vires* and those which are not. If the contract of such a corporation which is assailed be *ultra vires*, of course the question of reasonableness becomes irrelevant, since the charter is the reason of the being of the corporation. The doctrine is predicated on the opinion of the Court expressed by Mr. Chief Justice Fuller, in *Gibbs vs. B. Gas Co.*, that in the instance of business of such a character that it presumably cannot be restrained

to any extent whatever without prejudice to the public interests courts decline to enforce or sustain contracts imposing such restraint, however partial, because in contravention of public policy."

"But, manifestly, this language must be construed with reference to the facts of the case in which it was used. The contract was an agreement for the abandonment by one of the companies of the discharge of its duties to the public. It is also to be remembered that it was this character of contract, that is, one which was *ultra vires*, which was held to be illegal in the *West Virginia*, *Illinois* and *Georgia* cases, which were cited in the *Gibbs* case in support of the excerpt just quoted. In the subsequent case of *Chicago, etc. vs. Pullman* (139 U. S., 79), where a contract of the railway company was assailed as in restraint of trade, and the Court held, that although by the contract the company had restrained itself for a long period of years from using other than certain drawing-room and sleeping cars, the contract was yet held valid and proper. Manifestly, this decision is utterly irreconcilable with the view that in the case of a railroad company, every restraint imposed by contract upon its freedom of action is necessarily injurious to the public interests, and hence invalid."

#### Recent Pneumatic Tools.

In the *Railroad Gazette* of Oct. 2, 1896, was published a detailed description of various tools manufactured by the Chicago Pneumatic Tool Company. This company has for the past two years been making careful tests and experiments with their pneumatic hammers with a view to overcoming the unpleasant, and, with the heavier sizes, injurious vibrations brought upon the arm of the operator when in use. The outcome of these trials is a modification of the hammer which greatly simplifies the construction. The proportions of certain operating parts have been altered so that the vibration is reduced to a minimum. The hammer is styled the "New Boyer" to distinguish it from the old form which is still supplied to the trade if desired.

The general appearance and dimensions are not altered, the difference being in the operating valve. The valve mechanism of the new hammer is entirely different from the old, consisting of a single moving part; namely, the valve itself, which is formed of a thin cylindrical shell placed in the piston chamber, the piston traveling within the valve. By this arrangement a much longer piston chamber is obtained, hence a longer stroke, without increasing the length of the tool; also, the piston

is cushioned at either end of the stroke. With a longer stroke the force of the blows of the piston is increased and hence the new hammer has about one-third more power than the old. The substitution of a simple piston valve for the complicated arrangement previously used insures a longer life for the hammer and fewer repairs. The regulating mechanism in the handle is not changed. For the best working of these hammers an air pressure of 80 lbs. per square inch is recommended, but they can be operated with pressures varying from 20 to 100 lbs.

The new Boyer hammers are made in three sizes, Nos. 2, 3 and 4, weighing respectively 9, 8 and 7 lbs. each, with a stroke of 4½, 3 and 2 in. The No. 2 hammer is for extra heavy chalking and chipping. No. 3 for general chipping and cue beading, while No. 4 is for light work, such as tank riveting. The No. 3 hammer will bead two flues per minute.

The Crane Company, of Chicago, reports that for chipping castings one man with a pneumatic hammer does the work formerly performed by three men. Fireboxes are cut out with the aid of these tools in 2½ hours, where the same work was previously done by contract and 18½ hours allowed, while the Illinois Central claims a total saving of 10½ hours on each firebox by their use.

This company is now introducing also a new rotary compressed air drill which has a number of novel features. This drill consists essentially of three cylinders mounted on a frame, as in a brotherhood engine, except that in this case the shaft and crank are stationary and the cylinders revolve. By a system of gears the motion of the cylinders and frames is transmitted to the drill chuck and drill, the gears being such that the cylinders make eight times as many revolutions as the drill. These rotary drills are made in two sizes, the one which will drill holes up to 3½ in. in diameter weighs 38 lbs. and the 3½ in. drill weighs 28 lbs. When working with on air pressure of 80 lbs. per square inch the new drill requires 16 cu. ft. of free air per minute, while the old form of rotary used 65 cu. ft. Ball bearings are used throughout and all the mechanism is enclosed in a malleable iron case. Drills of this type were first put on the market in February, during which month 10 were sold; 50 were sold in March and the sales for April promise to be as many as 100.



There are now being made, at the Chicago ship yards, trials of a riveting machine to take the place of large, long reach riveters. This consists of two arms joined together above, built up of light plates and angles; at the end of one arm is a large sized pneumatic hammer, on the opposite arm is a pneumatic rivet holder-on. For certain classes of work this tool will be found very useful on account of its lightness, which will also make the first cost much less than the present forms of large portable riveters. The results so far attained have been very satisfactory.

The Chicago Pneumatic Tool Co. has had, during the last year, a business amounting to over \$100,000, having sold pneumatic hammers in foreign countries to the number of 196, to railroads in the United States 135, and to American manufacturers 450. These hammers are now being used on all the prominent railroads of Europe, and a large business is also being done with railroad companies in India, South America and Russia, while the government railroads of Germany are using them in all their shops.

#### The Ventilation of the Arlberg Tunnel.

The elaborate work on the Arlberg Railroad, issued as a memorial on its tenth anniversary, gives an interesting account of the effect of the gases of combustion in the long tunnel. This tunnel extends nearly straight east and west. From the east, after a level section only 23 ft. long, there is an ascent at the rate of 10 1/2 ft. per mile for a distance of 13,430 ft., and then at the rate of 80 ft. per mile for the other 20,065 ft. There are no shafts or provision for artificial ventilation. The winds are westerly about five-eighths of the time, and easterly 15 per cent. of the time, so that for 22 per cent. of the time the conditions are not favorable for a current in the tunnel in either direction.

Coal was used by the engines in the tunnel for a short time only, as the smoke so filled the tunnel that signaling was impossible and the brakemen and freight trainmen suffered greatly. Neither passengers nor passenger trainmen complained, however. Early in 1885 coke was introduced as the fuel and then for some years no injury whatever seemed to be suffered by the men employed in the tunnel. In 1888, 31 trains with 52 locomotives passed through the tunnel daily and nine trains crossed inside the tunnel in that time. Not till September, 1890, when the tunnel had been worked six years, were any ill effects observed from lack of ventilation. Then suddenly there were among the men employed in track work and in signaling attacks of illness which often resulted in fainting, greatly endangering the lives of the sufferers, as they might fall senseless in the way of passing trains. The symptoms were headaches, roaring in the ears, giddiness, vomiting, complete unconsciousness and sometimes cramps. Taken into fresh air, recovery was rapid. There were no fatal cases. On one occasion a working party engaged about one-third of the way from the western end of the tunnel had to be carried out by a freight train, because most of them had fainted, while at the same time another party about an equal distance from the east end had no trouble in working all day. There was no wind through the tunnel at the time. The worst experience was Oct. 3, 1890, when out of 27 men working in the tunnel 25 had to be carried out, most of them unconscious.

Hereupon a serious study was made of the circumstances affecting the ventilation of the tunnel. First, it was noted that all these fainting fits occurred between 8 and 11 o'clock in the morning, within which time four trains passed through the tunnel in one direction and three in the other, making two train crossings. It was at this time of day also that the wind changed direction most frequently. Further, the attacks came shortly after the substitution of one kind of coke for another, though chemical analysis showed no reason why one should vitiate the air more than the other, and probably this had nothing to do with it. Systematic observations of the direction of the wind were instituted, all fuels used were analysed, and the Vienna "chemical-microscopical laboratory for medicinal, hygienic and technical investigations" of Drs. M. and A. Jolles was engaged to analyse the air and the gases of combustion in the tunnel itself.

The fact that there had been no trouble during the first six years of the use of the tunnel led to the conclusion that the ballast of the road-bed, and especially the masonry lining of the tunnel had been able to absorb the most dangerous parts of the products of combustion. It was, therefore, determined to renew the whole ballast; and to reduce the amount of gases given off, special provision was made to provide the coke furnished the engines in a perfectly dry state; and, further, it was required that engines should dump their ashes and have perfectly free access of air to the fire just before entering the tunnel. Then it was ordered that in one direction there must be an interval of at least an hour between trains. The employees who had to work in the tunnel were usually admitted only at the times when the direction of the wind was favorable. Should conditions become unfavorable while the men were at work, an observer outside was instructed to give them notice. When it was necessary to work under unfavorable circumstances a foreman familiar with the tunnel work, but who had been outside for at least 24 hours, was assigned to accompany the chief of the party, that there might be some one capable of taking charge and telephoning for help in case of attacks; for those who were in the tunnel most constantly were most liable to be affected. Further, it was required that every man of

the tunnel gangs should work out of doors at least one day every week. On bad days, when it was absolutely necessary to work in the tunnel, the men were given a portion of hot soup mixed with wine, as it had been found that men imperfectly nourished were more subject to attacks.

After these measures had been taken, before the end of the month in which the attacks had been worst they ceased entirely, and neither in 1891 or 1892 was there any trouble to speak of on this score, although in the latter year an unusual number of workmen were employed in the tunnel reconstructing the lining. It was supposed that the measures already taken were sufficient, when, in June, 1893, it became necessary to relay the track, and also a telegraph cable, which was beneath the ballast. This required the employment of a large number of men and the disturbance of all the ballast. As early as the March before there had been a few men slightly affected, but as the track renewal went on the number and severity of the attacks increased, until June 16 no less than 74 men had to be carried out of the tunnel, most of them unconscious. The cases were commonest when there was no current in the tunnel, and the foulness of the air may be judged by the fact that an engine entering the tunnel at such times could consume its fuel only very imperfectly for lack of oxygen. The disturbance of the ballast doubtless set free large quantities of gas which it had been years in absorbing.

Again a thorough study was made of the ventilation of the tunnel, aiming, if nothing better could be done, to provide a store of pure air in certain places in the tunnel to be used for emergencies, as it had been found that the illness disappeared very quickly when the patient could breathe uncontaminated air. A study of liquid fuel was also made and experiments made with a system of artificial ventilation successfully employed in a tunnel between Bologna and Florence, which, however, is only one-third as long as the Arlberg Tunnel. Air reservoirs containing air under a pressure of 150 lbs. per square inch were actually provided in several places along the tunnel. In September, 1894, experiments were begun with a locomotive fitted for burning petroleum, and the results were so satisfactory, not only from a hygienic but from an economical point of view, that it was determined to use petroleum exclusively, and at the time the book was published, it was expected that all the engines would be fitted for burning this fuel by the beginning of this year.

Of course, the petroleum will give off some unbreathable gases, and the efforts to improve the ventilation of the tunnel are continued. The substitution of electricity for steam is regarded as impracticable in the present state of the art; but there is talk of providing electrical traction to carry the workmen to and from their work, which would reduce the time of their stay inside not only by the quicker passage, but especially by making it possible to take them out for their noon-day rest and meal, and it would also save their strength. With the changes already made, however, there has been a great improvement in the health of the men.

#### The Slide Rule as an Aid to Railroad Field Work.\*

BY GEORGE DUNCAN SNYDER.  
Assoc. M. Am. Soc. of C. E., City Engineer, Williamsport, Pa.  
(Continued from Page 61.)

**Long Chords.**—The formula for obtaining long chords is  $C = 2R \sin \frac{1}{2} I$ .

Example.—What is the long chord of a 5 deg. curve, with a total angle of 26 deg.? Set index of scale of  $B$  under 1,146 on  $A$ , move runner to 2 on  $B$ , move slide until 13 deg. on scale of sines coincides with index on under side of rule. Then the runner will be found to be set over 516 on scale  $B$ , the long chord required.

**Middle Ordinates.**—Middle ordinates can be obtained on the rule by using the usual formula, but the most convenient way is to set the index of slide over the middle ordinate for a 100 ft. chord of a 1 deg. curve, and the middle ordinate for any degree of curve will be found on the rule under the degree of curve on the slide. Thus set index of  $C$  over .218 on  $D$ , under 2 will be found .436, the ordinate for a 2 deg. curve; under 3 will be found .653, the ordinate for a 3 deg. curve; under 7 deg. 30 min. = 7.5, will be found 1.64, etc. The results thus obtained have no errors greater than .01 ft. up to a 20 deg. curve.

**External Secants.**—The formula for obtaining the external secant of a curve is,

$$\text{External secant} = R \tan \frac{1}{2} I \tan \frac{1}{4} I.$$

The setting is as follows: Place the index of scale of tangents over radius of curve on  $D$ , move runner to one-half the intersection angle, move index to runner; under one-fourth the total angle will be found the apex distance required. By reversing this setting the radius can be obtained when the total angle and external secant are given. The latter is a very handy setting when tangents are run to an intersection, as the distance can be measured from the apex to where the curve is to strike, and the proper radius of curve can be obtained on the rule.

Example 1. What is the external secant of a 7 deg. curve with a total angle of 36 deg. 40 min.? Here  $R = 819$ ;  $\frac{1}{2} I = 18$  deg. 20 min., and  $\frac{1}{4} I = 9$  deg. 10 min. Set the index of the scale of tangents to 819, move runner to 18 deg. 20 min., move index to runner; under 9 deg. 10 min. will be found 43.8, the external secant required.

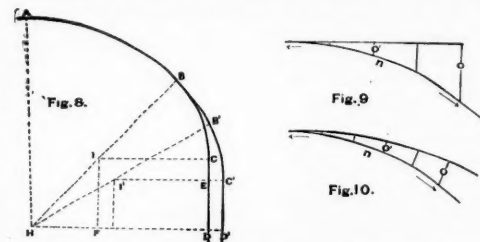
Example 2. What is the radius of a curve with a total

angle of 44 deg. 8 min. and an external secant of 56.4 ft.? Set 22 deg. 4 min. on scale of tangents over 56.4, move runner to index, move 11 deg. 2 min. to runner; under index will be found 712, equal to the radius of an 8 deg. 3 min. curve. In practice, unless the curve had to strike exactly 56.4 from the apex, an 8 deg. curve would be used.

**Deflections.**—To find deflections for sub-chords, set the index over the deflection for a 100 ft. chord expressed in minutes, then the deflections for any shorter chord will be found on  $D$  under the chord length on  $C$ .

Example 1.—What is the deflection for a chord of 56 ft. on an 8 deg. curve? The deflection for a full chord is 4 deg. = 240 min. Set index of  $C$  over 240 on  $D$ ; under 56 will be found 134.4 = 2 deg. 14.4 min., the deflection required.

Example 2.—What is the deflection for a chord of 87.7



ft. on a 3 deg. 57 min. curve? The deflection for a full chord is 1 deg. 58 1/2 min. = 118 1/2 min. Set index of  $C$  over 118.5 on  $D$ . Under 87.7 on  $C$  will be found 194 = 1 deg. 44 min., the deflection required.

**To Shift APC So That The Curve Shall Terminate in a Given Tangent.**—This problem occurs more frequently than any other in railroad location, and the slide rule is well adapted to it, as it will usually give results to the nearest tenth of a foot. The rule is to divide the distance square across between the terminal tangents by the sine of the total angle turned.

Example: Given a curve with a total angle of 20 deg. 20 min. How much must the  $PC$  be shifted to move the terminal tangent 17.6? Set 24 deg. 20 min. on scale of sines under 17.6 on scale  $A$ ; over index will be found 42.7, the shift required. With the slide still in the same position, opposite the angle consumed at each station will be found the distance the new curve di-

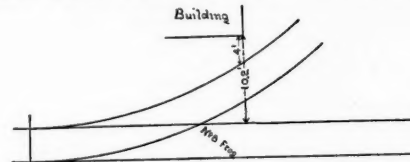


Fig. 12.

verges from the old at that station. Thus, if the above were a 2 deg. curve, opposite 2 deg. will be found 1.5; opposite 4 deg. will be found 3; opposite 12 deg. will be found 8.9, etc., being the distance the two curves will be apart at the first, second and sixth stations from the  $PC$ . In this way by taking offsets from the first curve to the points on the ground, the engineer can ascertain how the new curve will fit the ground at any number of points, with one setting of the rule.

**To Shift a PCC so that the Terminal Branch of the Curve Shall End in a Given Tangent.**—Let  $ABC$ , Fig. 8, be a compound curve terminating in the tangent  $CD$ . It is desired to shift the  $PCC$  so that the terminal arc shall end in the tangent  $C'D'$  distance  $EC'$  from  $CD$  and parallel thereto. To accomplish this the center point of the terminal arc must be shifted a distance equal to  $FG$ .  $FG$  is equal to  $EC'$ . By taking the difference in the radii  $HI$  is obtained. The total angle of the terminal arc already located is  $BIC = IHF$ . Having the side  $HI$  and the angles of the right triangle

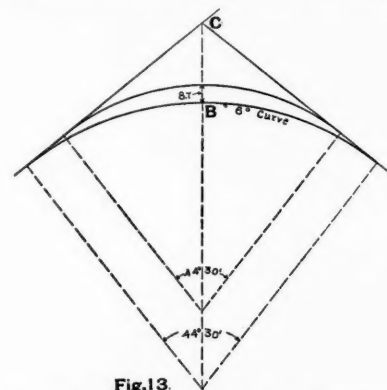


Fig. 13.

$IHF$ , the side  $HF$  can be obtained. To this add  $FG = EC$ , and the result is the side  $HG$  of the right triangle  $IHG$ . Having the sides  $HI$  and  $HG$  given, the angle  $IHG = BIC' =$  new total angle of terminal arc, can be obtained.

The setting is as follows: Place the index of the scale of sines under the difference in radii; over the sine of the complement of the total angle of the terminal arc will be found the distance  $HF$ . Leave the slide set in this position, and to  $HF$  add the distance  $EC$ , as measured on the ground; under their sum on the rule will be found the complement of the angle of the new terminal arc. In this case should the terminal tangent strike outside the proposed tangent, the difference of  $HF$  and

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$EC$  should be taken. By calling the larger radius  $R$ , the shorter radius,  $r$ , the side  $HF = C$  and  $EC = Q$ , the following general rule taken from "Shunk's Field Engineer" will be found to apply.

With radii in the order  $Rr$ , should the terminal tangent strike  $\left\{ \begin{array}{l} \text{inside} \\ \text{outside} \end{array} \right\}$  the proposed tangent; or with radii in the order of  $rR$ , should the terminal tangent strike  $\left\{ \begin{array}{l} \text{outside} \\ \text{inside} \end{array} \right\}$  the proposed tangent, the  $\left\{ \begin{array}{l} \text{sum} \\ \text{difference} \end{array} \right\}$  of  $Q$  and  $C$  will be found under the complement of the required angle.

Example 1.—A 5 deg. curve compounds into an 8 deg. curve, which consumes an angle of 54 deg. 20 min., and terminates in a tangent 44 ft. too far toward the center of the curve, find the total angle of the new terminal arc.

$$R = 1,146. \quad r = 716.$$

$$R - r = 1,146 - 716 = 430.$$

The complement of  $54^\circ 20' = 35^\circ 40'$ .

Set the index of scale of sines under 430; over 35 deg. 40 min. will be found 251.

$$251 + 44 = 295.$$

Under 295 will be found 43 deg. 15 min., which is the complement of 46 deg. 45 min., the total angle of the new terminal arc.

If the above curve had terminated 44 ft. too far away from the center of the curve, 44 would be subtracted from 251, which would leave 207. Under 207 would be found 28 deg. 45 min., which is the complement of 61 deg. 15 min.

Example 2.—A 5-deg. curve compounds into a 3-deg. curve, which consumes 37 deg. 15 min., and termin-

ates  $PC$ , what degree of curve should be substituted for the 6 deg.? Set 40 on  $B$  over 7 on  $D$ ; under the index on  $B$  will be found 817. Set 875 under index; over 817 will be found .933 deg. = 0 deg. 56 min., which to the 6 deg. curve makes 6 deg. 56 min., the new degree of curve. If it had been desired to strike 40 ft. toward the outside of the curve, 0 deg. 56 min. would be subtracted from 6 deg., and the new degree of curve would be 5 deg. 04 min.

Example 7: It is desired to construct a siding, as shown in Fig. 12, so that the nearer rail of the siding is 4 ft. from the corner of the building, which is 102 ft. from the near rail of the main track. Using a No. 8 frog and continuing the same rate of curvature beyond the frog, how far from the line of the building must the point of switch be placed? Here  $O = 98$ . Call  $D = 9$  deg. 30 min. Set 875 under index of  $A$ ; under 9.5 will be found 8.3. Set 8.3 under index; under 98, on  $B$ , will be found 344 on  $D$ , the distance the point of switch should be from the line of the building.

The preceding are only a few of the applications of the above formula that can be made, and many other uses for it will suggest themselves to the locating engineer. To quote Mr. A. M. Wellington, "the above formula should be indelibly engraved on the memory of every locating engineer."

To Shift the Middle Point of a Curve toward or from the Apex.—This problem can best be illustrated by an example:

Having run a 6 deg. curve with a total angle of 44 deg. 20 min., it is desired to substitute for it a curve that will strike 8.7 ft. nearer the apex, see Fig. 13.

The external secant  $BC$  must first be obtained, and

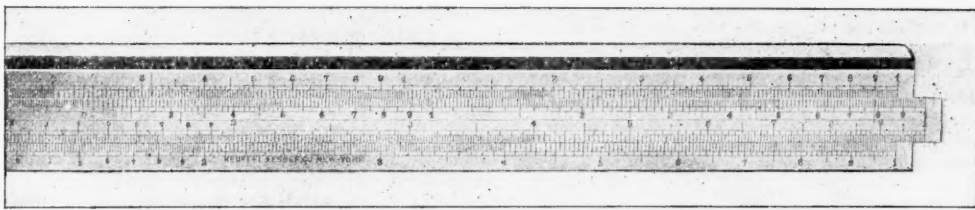


Fig. 11.—Slide-Rule Setting.

ates 24 ft. too far away from the center of the curve find the total angle of the new terminal arc.

$$R = 1910. \quad r = 1146.$$

$$R - r = 1910 - 1146 = 764.$$

The complement of 37 deg. 15 min. is 52 deg. 45 min. Set index under 764; over 52 deg. 45 min. will be found 610;  $610 + 24 = 634$ . Under 634 will be found 55 deg. 50 min., which is the complement of 34 deg. 10 min., the angle required.

If the above arc had terminated 24 ft. too far toward the center of the curve of 610 and 24 would be taken, which is 586. Under 586 will be found 49 deg. 50 min., which is the complement of 40 deg. 10 min.

Owing to the small scale on which the scale of sines is marked, the above method is not suitable where great refinement is required, or where the difference in the radii is great, or the total angle small, but in ordinary cases it will give results correct to the nearest 5 min. or 10 min., which is close enough for many purposes.

$O = \frac{1}{2} n^2 D$ .—The slide rule is peculiarly adapted to the formula,  $O = \frac{1}{2} n^2 D$ , first brought to the general notice of engineers by Mr. A. M. Wellington. In it, see Figs. 9 and 10,  $O$  = offset from tangent to curve, or from one curve to another,  $n$  = distance from  $PC$ , expressed in stations, and  $D$  deg. = degree of curve; or where one curve diverges from another it is equal to the difference in the rates of curvature. The use of this formula can best be illustrated by examples.  $\frac{1}{2} = .875$ , which will be used in all settings.

Example 1.—How far will a 1 deg. curve diverge from a tangent in 500 ft.? Set 875 on  $B$  under the right index of  $A$ . Over 5 on  $D$  will be found 21.8 on  $B$ , which is the required distance. With the slide still in the same position, the offsets for any other distance can be obtained. Thus, over 4 will be found 14; over 3 will be found 7.9; over 2.38 will be found 4.95, etc., see Fig. 11.

Example 2.—How far will a 4 deg. curve diverge from a tangent in 400 ft.? Set 875 on  $B$  under the right index of  $A$ ; under 4 will be found 3.5. Set 3.5 under the right index of  $A$ ; over 4 on  $D$  will be found 56 on  $B$ , the distance required.

Example 3.—How far will a 4 deg. 30 min. curve diverge from a 4 deg. curve in 700 ft.? Here  $D = 0$  deg. 30 min. = 0.5 deg. Set 875 under the right index of  $A$ ; under 5 will be found 437. Set 437 under index; over 7 on  $D$  will be found 21.5 on  $B$ , the distance required.

Example 4.—It is desired to start a curve at a certain point. The tangent is prolonged 450 beyond the  $PC$ , where the curve should strike 47 ft. to one side, what degree of curve should be used? Set 47 on  $B$  over 450 on  $D$ ; under the index of  $A$  will be found 2.33. Set 875 on  $B$  under the index of  $A$ ; over 2.33 will be found 2.67, equal to a 2 deg. 40 min. curve.

Example 5.—Having run a tangent to a certain point, it is desired to strike a point 98 ft. to one side, using an 8 deg. curve, how far back must the curve be started? Set 875 on  $B$  under the index of  $A$ ; under 8 will be found 7. Set 7 under the right index of  $A$ ; under 98 on  $B$  will be found 374 on  $D$ , which is the distance to move back for the  $PC$ .

Example 6.—Having run a 6 deg. curve for 700 ft., it is desired to strike 40 ft. toward the inside of the curve. Using

from it 8.7 must be subtracted, which will give the external secant of the new curve, and from it the new degree of curve can be obtained.

$$\text{Ex. sec.} = R \tan. \frac{1}{2} I \tan. \frac{1}{4} I.$$

$$R = 955, \frac{1}{2} I = 22^\circ 10', \frac{1}{4} I = 11^\circ 05'.$$

Set the index of the scale of tangents over 955, move runner to 22 deg. 10 min., move index to runner; under 11 deg. 05 min. will be found 76.3. Subtract 8.7 from 76.3, and 67.6, the new external secant, is obtained. Set 11 deg. 05 min. to 67.6, move runner to index. Set 22 deg. 10 min. to runner; under index will be found 844, which is a radius of a 6 deg. 48 min. curve. By calculating the apex distance of the two curves and taking their difference, the distance the new  $P. C.$  is from the old can be obtained. Had it been desired to make the new curve strike 8.7 ft. farther away from the apex, 8.7 should have been added to the external secant first obtained, and the setting proceeded with as before.

(TO BE CONTINUED.)

#### Railroad Legislation in North Dakota.

Two railroad laws were passed by the North Dakota Legislature just adjourned. The scope of the more important one of the two is clearly set forth in the title, which is as follows: "An act to regulate the transportation of passengers and property by common carriers, and the receiving, delivering, storing and handling of property between points within this state by railroads, railroad corporations, railroad companies, express companies, car companies, sleeping-car companies, freight and freight line companies, and common carriers engaged in the transportation of passengers or property on railroads in this state operated by steam, and bridge corporations and ferry companies, the property of which is used or operated for railroad purposes; to provide for the control thereof in the matter of rates to be charged for such transportation and the manner thereof; to define the powers and duties of commissioners of railroads, courts and other officers in regard to such regulations and control; to prescribe penalties for the violations of this act, and the rules, regulations, orders, judgments and decrees made under this act by such courts and commissioners for such regulation and control; also to repeal acts and parts of acts to conflict herewith."

The act gives the Commissioners of Railroads general supervision of all railroads and common carriers in the state and confers authority upon them to inquire into any neglect or violation of law by railroads. Requires the Commissioners from time to time to carefully examine and inspect the condition of each railroad in the state and of its equipment, and the manner of its conduct and management with reference to public safety and convenience, and they are authorized in their discretion to direct repairs to be made and additions made to rolling stock, to order changes of station-houses and to direct any change in the mode of operating the road or of conducting business, deemed by them reasonable and expedient to promote security and convenience to the public. Power is given the Commissioners to ex-

amine books and papers of any railroad company and to examine any officer thereof under oath, in the discharge of their duties, and they are directed to proceed to fix reasonable rates for the transportation of freight and passengers within 60 days after approval of the act. The act makes it unlawful for any common carrier to charge greater compensation for a shorter than for a longer distance, and all combinations or pooling of interests by railroad companies are also declared unlawful. Railroad are made liable in treble damages for any violation of the act.

The commissioners are empowered to change rates from time to time on complaint or otherwise, but not oftener than once in six months, unless the rates last established be set aside by order of the court. Appeals are allowed from all orders and decisions of commissioners to the District Court, and from that court to the Supreme Court; and for the purpose of hearing such appeals each of said courts shall be always deemed open. District courts are empowered to enforce all orders of commissioners on petition of owners or any party interested.

Railroads are required to make annual reports to the commission, and in addition thereto such special reports as may be demanded from time to time.

This law was taken from the present law in force in the state of Iowa, but is changed so as to agree with the constitution of North Dakota.

The other law enacted is one which defines luggage and compels railroads to carry bicycles as such free of charge. This law was taken from the New York law on this subject, and was advocated before the legislative committee by representatives of the League of American Wheelmen.

#### Le Chatelier's Pyrometer.

The accurate measurement of very high temperatures, such as the fusing point of various metals, etc., is a difficult undertaking, and a great variety of instruments is in existence for the accomplishment of it. Of the numerous physical principles involved in the action of these devices, some pyrometers are constructed so that the temperature to which they are subjected may be inferred either from the change in the electrical resistance of a certain wire, with a change of temperature, or from the current developed in a circuit containing two different metals whose junction is in contact with the source of heat. The current so produced is called a thermo-electric current. Le Chatelier's pyrometer operates upon this principle.

As long ago as 1833, it was discovered that in any circuit composed of two different metals, a difference of temperature between the two junctions develops a difference of electric potential between the two metals at the junctions, causing a current to flow from one to the other. This difference of electric potential is almost exactly proportional to the difference of temperature between the two junctions.

In a recent number of the Magazine of the Austrian Engineers' and Architects' Society, there is an account of a series of exhaustive tests of the accuracy of the Le Chatelier pyrometer, by Doctors Holborn and Wien, at the Government Physical Laboratory, Charlottenburg. The instrument consists essentially of two parts, the thermo-electric couple, and the galvanometer. The former consists of two wires, one of platinum, and the other an alloy of platinum and rhodium (in the proportion of 90 per cent. platinum and 10 per cent. rhodium), enclosed in a glazed porcelain tube 1 meter long and 35 millimeters in diameter. These wires are joined at one extremity of the tube, and brought out at its other end so that they may be connected to the galvanometer. Of course, they are insulated from each other throughout the whole length of the tube except at one end, as mentioned above. The galvanometer is of the D'Arsonva type, with stationary permanent magnets and movable coil, wound especially for the detection of currents at low electromotive force.

The results reached by these two experimenters are very interesting. They show that with this instrument and a suitable galvanometer, it is possible to measure a temperature as high as 1,800 degs. C., with a limit of error not more than  $\pm 5$  deg. in 1,000 deg. In other words, an accuracy of .5 of 1 per cent. This is a very remarkable result, and was obtained after careful comparison of the pyrometer with the air thermometer, reckoning on the "absolute" scale of temperatures, i. e. from  $-273$  deg. C., as the absolute zero. In some of their experiments the heat of the furnace was great enough to soften the porcelain tube to a very considerable degree, but the function of the wires was not interfered with, and probably would not be, until a temperature very near the melting point of one of them were reached. In addition to the accuracy of the instrument, its portability, and the ease with which any temperature can be deduced from the current indicated by the galvanometer, makes it adaptable to a large variety of uses in the arts and manufactures.

#### Car Coupler Litigation.

The suit of the St. Louis Car Coupler Company against the National Malleable Castings Co. was decided by Judge Taft at Cincinnati on Monday in favor of the National Malleable Castings Co., to the effect that the Tower coupler does not infringe. The bill was dismissed at the cost of complainant.





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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Senator Foraker has already introduced in Congress a bill to legalize pooling by railroads, though there is no evidence as yet that the Supreme Court decision has made the views of the members of Congress any more favorable to such a law than they were before. Mr. Foraker's bill is similar to Representative Patterson's, that has been familiar to railroad men for the last four years. Besides the pooling clause it has a large number of other amendments to the Interstate Commerce law, some of which are open to criticism. The pooling provision itself is one the probable effect of which no one can even guess at. In order to meet the views of the opponents of pooling, it provides that every pool may be forbidden by the Interstate Commerce Commission before it goes into effect, the action of the Commission to be based on its opinion of the probable effect of the proposed pool on rates; out how can the Commissioners, or any one else, form a judgment beforehand on this point? One might as well try to predict in the evening the probable effect of a northwest wind upon the thickness of the ice in a mill pond by the following morning; and to make the comparison fair, the ice guesser should be required to come within  $\frac{1}{32}$  of an inch in his estimate, and should be hampered by a prediction from the weather bureau that the wind would probably change to southwest during the night. If the Commissioners think that a proposed pool will simply prevent demoralization, and decide to forbid it, that is equivalent to deciding that existing rates are too high; but why not say that directly? The power to thus decide exists already. If a pool is forbidden because it is likely to enable a railroad to raise rates, the government is simply refusing to permit the railroads to cure a present and known evil, because of a fear of future supposed troubles; for no railroad officer, or any one else, can tell what good a pool will do until he tries it; there are too many of the elements of competition left unaffected by the pool. This is the lesson of universal experience.

There can be no question that the anti-trust law applies to a labor union as well as to a union of capitalists. This fact is now being recognized on all sides, and by many it is looked upon as a new thing, though the federal courts enunciated it clearly in the case against Debs in 1894. Moreover, the Supreme Court's decision, that the law must be strictly construed, gives it a very practical application, at least to brotherhoods which, like that of the locomotive engineers, have an appreciable influence on rates of wages. The New York *Journal of Commerce* takes issue with its contemporaries who are now telling the labor unions of their new misfortune, holding, evidently, that the unions do not, unless they strike, do any acts which can be construed as restraints upon trade. We think the *Journal* misapprehends the case. It is true that most strikes and other aggressive acts on the part of labor unions are without the jurisdiction of Congress, affecting, as they do, only matters within a

single state; but the locomotive engineers are engaged in interstate traffic all over the country, and as it is universally admitted that the wages of enginemen would be lower than they are, were it not for the power exerted by this brotherhood, why should not the organization be disbanded? To maintain high wages certainly helps to keep up freight rates; probably the effect is just as potent as that of an association of traffic officers meeting to discuss tariff details. In point of fact, the maintenance of wages has undoubtedly done more to prevent the reduction of rates than traffic associations have, for the efforts to maintain wages have succeeded, while a large share of the efforts to maintain rates through association agreement have been attended by partial or complete failure. This phase of the anti-trust decision must appeal to Congressmen, but whether this apparent injustice to their friends will make clear to them the injustice to their enemies, the bloated bondholders, is another question. However this may be, the Congressman who wishes to exempt labor unions from the anti-trust law will probably have little difficulty in procuring the passage of an amendment to that effect.

#### Fast and Frequent Traffic in a Tunnel.

Since writing on the subject of working a frequent and fast service through a tunnel (*Railroad Gazette* March 26, p. 225), we have received some further information bearing on the subject. The Central Railroad of New Jersey was famous some years ago for its success in dispatching frequent trains without the block system. That success was the result of fine discipline. Now the conditions there are modified by a complete block system, but very frequent trains are still sent out. Of course this is not tunnel working, Mr. Olhausen writes regarding this experience as follows:

"We did for a number of years start trains from this station following one another in procession of less than half a minute interval, the first being a Philadelphia train, first stop Elizabeth; the second an Easton train, first stop Elizabeth, and the third a Long Branch train, which turned off at Elizabethport. This was done until we put in the pneumatic block in 1889.

"We still send out three, four and five trains on one schedule, but they are spaced by our blocks, which are from 1,200 to 1,500 ft. apart between here and Elizabethport, and half a mile apart between that point and Bound Brook. For instance, at 4:30 p. m., we have first a Philadelphia train, making no stop this side of Bound Brook, next comes a Somerville express train making first stop at Plainfield, then a Long Branch train which turns off at Elizabethport, after that a semi-express, first stop, West Eighth street, and next a local. These all run out on the same track and on the same time, but, as before stated, they are spaced by the home and distant signals.

"No doubt the plan suggested of despatching trains at intervals of one minute, and making a run of 16 miles without a stop, at the rate of 30 miles an hour, descending a 75-ft. grade at the start and ascending a 75-ft. grade at the other end, can be done as long as everything goes right, but I should want the tunnel well lighted and well signaled with both home and distant signals."

Concerning the condition of the rail in a long tunnel, Mr. Cheever, Chief Engineer of the Fitchburg Railroad, writing of the Hoosac Tunnel, says:

"We are troubled considerably with a 'greasy' condition of the rails which is especially noticeable on the grade of 26.4 ft. per mile from West Portal to Central Shaft, covering a distance of about  $2\frac{1}{4}$  miles. Approaching the tunnel at the west end for about two miles the track lies on an ascending grade of 40 ft. per mile, which in practice is not so much of an obstacle to trains as the lower rate of grade in the tunnel. The difference, in my opinion, is entirely due to the condition of the rails, and it is caused by outside atmospheric conditions in this way: When the air is damp and heavy in the summer the air in the tunnel is cooler than the outside air and the ventilation is interfered with. The draft thus comes down the central shaft and becomes insufficient to move the smoke and vapor which accumulate from heavy eastbound freight trains in the west end of the tunnel, and the passing trains drag it with them back and forth, sometimes pulling it out into the cut at the approach for several hundred feet. At such times, which occur quite often between July and October, we have much slipping of drivers and a great deal of sand is used which accumulates around the rails in such quantities that it often becomes an impediment to the wheels.

"As there is a great deal of destructive chemical action in the Hoosac Tunnel on account of smoke and gas, I am not able to separate the effect of chemical action from that of moisture alone. It might be with other motive power than steam locomotives, that dampness alone would not produce the effect we get.

"We do not have much trouble of this kind in the east end of the tunnel, but our westbound freight trains are not so heavy and the engines do not have to burn so much coal on westbound runs. On the east end the tunnel is much drier than at the west end, comparatively little water going to the east end from the summit. I think that in such a tunnel as would be built under the East River in Brooklyn there would be trouble from greasy rails if it was operated by steam locomotives."

Since we wrote last week we have seen a profile of the proposed East River tunnel of the Long Island Railroad (which is the one in question) which modifies considerably the distances and grades which we gave in the former article. The total distance from the beginning in New York City, at a point between West and Washington streets to Jamaica is 12.30 miles instead of 10. About one-third of a mile from the first station in New York there would be a second (tunnel) station, and from this the run would be made without a stop, say 12 miles.

The total length of tunnel is 2.72 miles. The heaviest tunnel grades which we assumed were  $\frac{1}{4}$  per cent. (79.2 feet per mile). The maximum grades will, however, be heavier, increasing the distance in which the stops can be made. They are as follows: Down, 80 feet per mile for 1,420 feet; level, 320 feet (station stop); down, 88 feet per mile, 2,000 feet; down, 26.4 feet per mile, 880 feet; up, 105.6 feet per mile, 3,300 feet; level, 320 feet; up, 74 feet per mile, 5,120 feet. Of course, in running west the trains will go down the long grade of 74 feet per mile, and directly after that follows the long down grade of 105.6 feet per mile. Thus the stops will require more distance, which will modify somewhat the length of the blocks; otherwise the problem remains as we stated it last week, and for the present we leave it with our readers, from whom we shall hope to hear further on this very important scheme.

#### The Anti-Trust Law Decision.

We have condensed the 17,000 words of the Supreme Court's decision in the case of the Trans-Missouri Freight Association into about 5,000; but the reader who wishes to keep the decision in his mind may readily make a further condensation, bringing the whole thing down to a single sentence. The anti-trust law declares every contract in restraint of interstate commerce illegal, and that is the end of it; if Congress has passed an unreasonable law, let Congress correct the error. Not to be disrespectful to Judge Peckham's voluminous reasons, however, this brief statement may be amplified as follows: The language of the anti-trust act is so plain that nothing can shake it; interstate railroad transportation is, undeniably, commerce; nothing in the inter-state commerce law authorizes making agreements between competing railroads; the rejection by Congress of an amendment to the trust act which would specifically include railroads affords no evidence that Congress was blind to the fact that the word "every" includes all contracts by whomsoever made; Congress cannot be presumed to have meant only certain kinds of combinations, for railroads as well as oil and sugar trusts were complained of by the people; railroads are different from other commercial enterprises, but this is no reason for being more lenient with them; being public enterprises they may well be held to require more special attention from the legislature; the common-law rule, to apply the test of reasonableness to all laws, is, in this case, shut out by the simplicity and the directness of the language of the statute; it is not universally admitted that free competition between railroads is an evil; the agreement authorizes an association to make rates, these rates the individual roads agree to conform to, and this is necessarily and directly a restraint upon commerce, in spite of the 30-day clause and other provisions by which roads may avoid compliance with the orders of the association.

The dissenting opinion is more than half as long as that of the majority. This also we have condensed as well as we could, within available space, though not so satisfactorily as we could wish. The substance of Justice White's argument is that if the requirement imposed by Congress is unreasonable under the common law, Congress has passed an unreasonable law, and this is tantamount to saying that Congress itself is unreasonable, having violated the elementary interests of justice; innumerable judicial decisions have established as a fact of common law, that the rule of reasonableness should apply in the interpretation of a law like this; Congress cannot rightfully give a new meaning to a technical phrase like "restraint of trade"; a strict construction of the act will work enormous injustice; no rule requires submission to such a result, the rightful rule being, rather, that we should be guided by the spirit which vivifieth rather than by the letter which killeth. Furthermore, Congress did not intend to make the law apply to railroads.

There can be no question that this decision, overturning, as it does, the decisions of scores or hundreds of judges on a great variety of questions, has proved a great setback to the movement in the commercial world toward prosperity, which everyone believes had at last got started. Many prominent railroad stocks fell off from 2 to 7 per cent. in Wall street and there



was no other explanation of the shrinkage\*. The prevailing opinion, not only in "the street," but among competent judges generally, is in consonance with this fall in prices. With the very meager freight business now moving on most railroads, the demoralization in rates may not be so bad as some predict. Demoralization is almost sure to follow, not only the absence of a well-established and systematic association, but even a little looseness in an association ostensibly in good order. It may not appear in any marked degree for several weeks or months, but unless some remedy is devised it is sure to come. The principal fact which affords hope that the demoralization may not be severe is that the rates are already so near the cost basis. Competitive freight throughout the country is carried at such narrow margins that a very little further reduction may, indeed, lead managers to take the bull by the horns and refuse to receive some classes of shipments. None but the richest roads have gone to this extreme heretofore, at least not directly and in a way to make the act noticeable, but if independent rate-making becomes general, many traffic managers who have hitherto aimed to get "tonnage," almost regardless of profit, will be compelled to begin looking out for the danger line.

There is no denying that the argument of the majority of the Court is the easier of the two to maintain. The side of the strict constructionists is pretty sure to win as long as the issue depends upon pure reasoning. It is interesting to note that only a few months ago the Brown case was decided by the Supreme Court (compelling unwilling witnesses to testify) by a vote just like this one, 5 to 4; but in that case the majority were in favor of the application of the rule of reason, so called, denying the forcible arguments of the minority in favor of strict construction. Curiously, the dissenters were the same then as now, Messrs. White, Field, Shiras and Gray. Then they were strict constructionists; now they take the opposite view. In the present case Mr. Justice White has the difficult task of combatting what seems to have been the plain intent of a frivolous-minded Congress, with the question complicated by a divided public opinion. In the case of the constitutional exemption of unwilling witnesses, most of the issues depended upon history. It seems a pity to have to spend so much effort in the attempt to discover what Congress really meant, when in all probability, if the facts could be known, the attitude of many of the members—very likely of a number large enough to hold the balance of power—would be best described by the term "don't-care." The whole movement was a blind attempt to grapple with a problem which every reflecting man felt to be too intricate to be dealt with successfully in that superficial way.

The Joint Traffic Association is now a perfectly legal body, for it has been sustained by two high courts, and it would appear that it can continue in operation, unless some new motion for an injunction should be made and entertained by a court; but we cannot see how the Supreme Court can approve it without reversing its present decision. It is true that in forming this association much greater care was taken to comply with the interstate commerce act, and also to comply with the anti-trust law (assuming that that law would be interpreted, as all such laws generally are, in the light of its reasonable effect). Some roads objected to allowing an association to make rates for them, and the agreement was happily changed so as to leave each road free. Objections innumerable were made by the counsel of various roads, men who aimed to place a very strict construction upon all the restrictions of the law, and advised their managements unreservedly to conform to the laws thus construed, and all these objections were met. The railroads would not bind themselves, even to the moderate degree that they did—to change rates only by formal action in a meeting of directors—without first examining very carefully every feature of the laws liable to affect them after the proposed changes should be made. They left only one weak spot—the regulation calling for the payment of heavy fines, which might be construed as equivalent to pool payments, and therefore unlawful—but in the course of 15 months that regulation has never been enforced in any matter of any consequence. But all these efforts to make a strictly legal agreement are

nullified by the decision of the court that an agreement intended to keep rates from falling is an illegal restraint upon commerce. Whether it actually has any effect or not.

The decision sweeps away all sophistries, judicial or otherwise, by which the meaning of words in statutes is modified to conform to the exigencies of practical life. We confess that on general principles we favor strict construction of all statutes, and we must say that we have often been puzzled (as in the case of the Brown decision, which so palpably weakened the fifth amendment to the Constitution) to discern what basis, in conscience or ethics, our distinguished judges could find to support their subtle arguments in this line, tending to confuse the meaning of words and perplex every layman having to do with the law, and all for nothing higher than to enable a judge to decide a question on the same basis that jurymen generally do; that is, according to the sympathies of his heart rather than in conformity to the reasoning of his head. Lawyers will watch with particular interest all subsequent decisions of the Supreme Court in this line to see whether the innovation now announced can be consistently maintained.

There has been considerable speculation in New York and Philadelphia as to why the Chicago roads were so quick to abandon their associations. One reason, doubtless, for this is that the counsel of those roads, having been vitally interested in the Trans-Missouri case, were more familiar with the arguments on both sides and more quickly grasped the meaning of the decision. The decision being by the highest court the usual resources of the lawyers, delays and appeals, were utterly worthless, and there was nothing to do but submit. Again, the natural propensity of the rate maker to kick over the traces never has been so well curbed in the West as in the East, and it is not at all unlikely that some of the withdrawing roads were glad to try freedom once more. There has been some little friction all the time. But the higher managing officers take a more active interest in rate regulation than ever before, and we may hope that if any warlike action shall be taken, it will be like that of the European powers in the Mediterranean, exceedingly cautious.

The practical question now is to see whether anything can be done in Congress. This seems to be universally agreed. The House of Representatives is, however, a very unwieldy body, and under the most favorable circumstances it takes time for it to reach even a vague opinion on a new subject. This would be true even if the majority of the members were much more intelligent, sincere and public spirited than we now give them credit for being. A proposition to allow railroads to pool earnings has already been discussed in Congress, and the discussion has been repeated each session; but, so far as can be judged at this distance, it would be unsafe to assume that even the old members have an intelligent idea of the essential and important considerations that should guide their votes on this subject, and there are now many new members. A proposition to legalize such a body as the Joint Traffic Association ought really to find more favor in Congress than an out-and-out proposition to legalize pooling, for it would be a much less radical invasion of the pet theories of the Populist or Granger, but we cannot say that we think the difference between the two propositions would be generally recognized. In all probability the two would be lumped together as twin brothers and both be regarded as schemes to make exorbitant rates. But we cannot see why it is not fair to regard a law legalizing the Joint Traffic Association, in substantially its present form, as truly representing public opinion. The business community has, by many expressions, approved the principles of the Joint Traffic Association, knowing, as the merchants now do, that it steadies rates without raising them; and people who are "agin' the railroads" ought to find no fault, for the association has done them no harm. It has been trying hard for over a year to make some money out of the transportation of the farmers' corn and wheat, and yet has failed to get more than a barely living rate.

It is said that the railroad associations can keep on in spite of the decision, simply changing from business bodies into mere conferences. This idea has undoubtedly some basis, and if we may take the word of some of the juvenile editors, it could be carried out to perfection, making everybody happy. Better still, a railroad may, they say, act independently and come out all right. Stop secret rate cutting, stop lying, obey the law, and no conference will be needed. But let us see. The most successful agreement, outside a formal association, is that of the anthracite coal producers, which is in a sense a railroad agreement, though it is based on production of coal at the mines. For a year, more or less, this agreement has

been pretty well kept, or is said to have been. There was no formal contract, and, apparently, nothing more tangible than a verbal understanding. But it is to be remembered that there were only a dozen (or less) parties to the agreement, that the territory is limited, being in this respect so small as not to be compared to the large traffic associations, and that there was virtually only one rate to be considered. And, again, the changes in ownership in the shares of the coal companies, bringing former rivals into friendly relations, may have been, and by many is fully believed to have been, more potent to restrain rate cutting than weeks of discussion among subordinate officers would be. Traffic officers having to make a hundred rates a week cannot depend upon the coal men for an example of a workable scheme.

Take, again, the successive rate agreements made the past few years at Chicago. Not long ago the presidents of the roads west of that city met for the purpose of stopping the demoralization then existing, and they reached a substantial agreement without any statistics at all and with very little record. A couple of sheets of foolscap told all that was done. This, certainly was direct and expeditious enough to satisfy the most academic of editors, even the *New York Tribune*. But, being railroad managers, they followed this action by the establishment of a board of five managers at salaries of \$10,000 a year, more or less, to sit constantly, to carry out the agreement that had been made. Why was this done? Would they spend \$50,000 or \$100,000 a year just for the fun of it, or just to give places to friends? Not by any means. There is no money to be wasted in that way, and if easy places are to be made for friends it will be done by some other method. The fact is, the business of making freight rates is so complicated, and so important, and covers such a great extent of territory and such varied conditions, that only by means of a systematic organization can it be kept within bounds—kept where the managing officials can retain a fair knowledge of it, not to mention controlling it.

Each editor who feels so sure that he can handle a traffic office should examine the rate-bureau of a single large road. Look at the records, investigations and computations that are needed just to deal with the business of that one road, aside from relations with competitors. Mentally multiply this organization by the square of the number of other roads with which this one does business, and some idea may be gained of the work that an association of roads has to do.

It may be that railroad officers are blameworthy for trying to do too much. It is true that one small brain—that of a general freight agent—often tries to furnish the wisdom for a hundred transactions, where each one of the hundred needs the undivided attention of an experienced traffic man for as much time as the one man spends on the hundred. But this is a condition that cannot at once be changed, even if it be proved desirable. A traffic manager cannot be found in a day. Each one is valuable in his place largely in consequence of his long experience in that place. It is an inexorable fact, therefore, that freight rates cannot be kept steady, and even poorly remunerative, except by elaborate agreements, which shall be made matters of record. But at present any kind of an agreement is a conspiracy and illegal, for it has a tendency to keep rates from falling; so that we are not likely to see many of them recorded. After a few weeks or months we can probably see what virtue there is in unrecorded agreements.

#### The Bituminous Coal Trade at the Seaboard.

The bituminous coal tidewater market appears to be a good deal upset and there seems to be little prospect of straightening it out in time to secure a fair profit on this year's business. In order to state the situation understandingly, it is necessary to consider conditions of twelve months ago, and controlling events succeeding, up to the present time.

In April, 1896, the soft coal pool went into operation. It undertook to regulate the output of the various interests shipping to tidewater and to control prices. Attempts in both of these directions had been made before, but had failed because the full co-operation of the shipping railroads was lacking. This time the shippers were given to understand that the railroads were tired of rebates, senseless competition and small minimum profits, and that they would stand back of the pool. Allotments were made to each region on a basis of the production of the past five years. Each region was in a measure made responsible for its own members; penalties were provided, the government was vested in an executive committee, prices were fixed, and it looked as if all might pull together.

Consuming railroads, large manufacturers and ocean shipping interests refused at first to pay the advance asked, which amounted to some 30 to 50 cents a ton. The price schedule was as follows: Norfolk, Newport News and Philadelphia, \$2.35 and Baltimore, \$2.28 per ton, with 10 cents differential for Clearfield coal. Early

\*The following are the highest prices of leading railroad stocks March 22, the closing prices and the changes in one week:

	High. March 22.	Close. March 29.	Net de- cline.
Chicago, Burlington & Quincy.....	77½	76½	1%
Chicago & Northwestern.....	100½	103½	3%
Louisville & Nashville.....	49½	45	4½
Missouri Pacific.....	18½	15½	3%
Central of New Jersey.....	91¼	85½	5½
New York Central.....	102	97½	4½
C. R. I. & P.....	68½	60½	8%
Chic. Mil. & St. Paul.....	78½	71½	6%
Southern Railway, preferred.....	29	25½	3½
Phila. & Reading.....	20½	20½	2½



in the life of the agreement two shippers over the Pennsylvania Railroad secured a large contract from a New England railroad company, at a figure which it was afterward learned was below pool prices. The late President Roberts held a conference with the shippers, with the result that they spent a most uncomfortable hour and failed to book a profit on the contract in question. This was the first definite notice which the trade had that the railroads were really backing the pool. It immediately imparted stability to the situation and led to making a comparatively large number of contracts.

About midsummer, trade became very dull, in consequence of the general industrial depression and the persistent refusal of some of the large railroad consumers to contract for more than immediate requirements of coal. About this time it was noticed that the Baltimore & Ohio was doing a heavy business. It seems that this company had taken contracts from certain railroads to furnish fuel to consist of gas coal at rates considerably below the pool prices. Gas coal had not been included in the agreement. The Baltimore & Ohio operators had large mines of this grade in the Flemington region and through its interpretation of the agreement the Baltimore & Ohio was able to ship in nine months considerably more coal than it was allotted for the twelve. Protests were made, but nothing could be agreed upon.

About the close of the year most of the interests, after a series of meetings, were ready to sign an agreement for 1897 similar to that of 1896, with needed amendments, when it was discovered that coal was being sold by certain Baltimore & Ohio shippers at \$1.75 f. o. b. Baltimore, against the pool price of \$2.25. This ended all talk of an agreement and was immediately followed by demoralization. The Chesapeake & Ohio, which had kept faith perfectly, became wearied by Baltimore & Ohio tactics and went in for business without much regard for price. Other producers and shippers followed. Prices were made as low as \$1.32½ Philadelphia, and it is claimed in some quarters that the figure of \$1 a ton was made. It was a scramble for tonnage in which prices had secondary consideration. It is very difficult to quote prices to-day, as they are largely a matter of bargain. Moreover, they, in a measure, represent spasmodic business, as most of the heavy tonnage for 1897 has been contracted and at figures which show a loss as compared with the 1896 prices of from 45 to 75 cents a ton. The nominal quotation is \$1.00 at Norfolk, Newport News and Philadelphia, with 10 cents differential in favor of the Clearfield region. It is figured that the loss to the trade this year will be from 5 to 10 million dollars.

That Baltimore & Ohio is the offender no one seems to question. Even that interest does not now deny the fact, although it claims a right to do as it did. The tonnage shipped in 1896 was 16,624,737 tons. Comparisons, by regions, with 1895 follow:

	1896.	1895.	Change.
Beech Creek.....	3,077,834	2,906,432	Inc. 171,402
Clearfield.....	2,262,993	2,559,452	Dec. 296,459
Broad Top.....	374,797	507,184	Dec. 132,387
Cumberland.....	4,500,254	4,129,313	Inc. 370,941
Chesapeake & Ohio.....	3,539,093	4,069,924	Dec. 481,241
Pennsylvanias (P).....	2,798,766	2,469,718	Inc. 329,048
Total.....	16,624,737	16,689,423	Net Dec. 67,686

Thus it will be seen that despite the reduced railroad traffic and mill operations in 1896, as compared with 1895, the output was only 44,686 tons less. This heavy overproduction was initiated by Baltimore & Ohio. Other interests, not wishing to fall behind, turned out vastly more coal than was needed to meet their requirements.

The writer asked an executive of one of the leading companies what interests, in his opinion, had booked the 1897 tonnage. He believed that each interest had about the same tonnage as last year. Their customers, however, had in many instances changed.

It is reasonable to assume that the current low prices will not rule throughout the year. However, any advance would not materially increase the year's revenue, as contracts now booked, and at the low prices as stated, cover the year's business.

#### An Interesting Passenger Fare Decision.

The decision of the Interstate Commerce Commission on the passenger fare over the Eureka Springs Railway Company, reported in the *Railroad Gazette* of March 19, is worthy of remark as being one of the few in which a commissioner has published a dissenting opinion. In fact, we remember no recent decision which has not been unanimous, and none during the whole life of the commission in which the dissenter took the side of the railroad company. In this case the majority opinion is by Chairman Morrison, and he seems to have held that 10 cents a mile between Eureka Springs, Ark., and Seligman, Mo., was too high, because the local rates within the state of Arkansas were limited to 5 cents a mile by law and those in Missouri to 4 cents a mile; "the whole should not be greater than its parts." The decision finds that the net earnings of the road (approximately equal to six per cent. on the first mortgage bonds) are in excess of a moderate return on the actual investment, although the road pays no dividend and no interest on its income bonds. The fare was ordered reduced to 6½ cents a mile. The road was built to connect the St. Louis & San Francisco, with a health resort, and people traveling to the Springs for health or pleasure furnish most of the passenger patronage of the road. The St. Louis & San Francisco, to induce the building of this line (a branch of its own), made a 50-year contract to pay to the branch company 10 per cent. of its own earnings

on certain passenger business to and from the branch. The decision says that if financial and business conditions were not unusually bad at present, the rate would be ordered reduced to 82½ cents instead of only to \$1.20.

Commissioner Knapp, dissenting, says that he cannot assent to an order reducing the through fare more than one-third, and probably reducing the gross passenger receipts 30 per cent. Since the complaint was filed (Jan. 29, 1895), two annual reports from the road have shown a diminishing business. These reports may properly be considered because the commission is fixing a standard for the future, not settling a dispute of the past. These two annual reports "tend strongly to sustain the position of the defendant that, with the reduced rate, the company cannot maintain its solvency," and Mr. Knapp feels reasonably certain that the company will not be able to pay the interest on its first mortgage bonds. The rebate or commission from the St. Louis & San Francisco may be cut off, as the latter road has been sold under foreclosure, and the new company is probably not bound by the contract. The annual reports indicate that the road has been conducted with care and economy. The rates do not discriminate against any town or any article of traffic. There is no proof that the road was not honestly built, and the first mortgage bonds were sold at a discount (10 per cent.), not unusual under the circumstances.

The gist of Mr. Morrison's view seems to be that as long as Arkansas and Missouri limit fares it is right for him to do likewise, and that 6½ per cent. (6 per cent. on bonds sold at 90) is too high a rate of interest for a railroad to earn. The underlying theory of this doctrine is fallacious and destructive to human progress; but even if it were good theory it does not apply in this case. According to Mr. Knapp's analysis, the reduction will probably be, not to five per cent. or four, or whatever a Populist thinks a bondholder ought to earn, but to nothing at all. And even if the reduction were more moderate, the business of the last year or two seems to have dropped off so seriously that the reduction of income will come fast enough without any assistance. The road has laid no new rails for three years.

The chief strength of the argument for reducing a railroad's income in hard times is that everybody else has to suffer and the railroads ought not to be allowed to hogishly evade their share of the burden. For the average legislator and country politician this is overwhelmingly convincing. But there are two points militating against this theory that even a legislator ought to be able to comprehend. First, a railroad can suffer severely two or three years from hard times and not show it, at least not to the outside observer. Such appears to be the case with the Eureka Springs Company. The hard times strike it now worse than in 1893 and 1894. But the postponed repairs and renewals have to come some time, and then there will be no money with which to make them. Second, the patrons of the road are as much interested in this matter of accumulating money for keeping up the property as the company possibly can be. Lack of money means impaired safety and many deficiencies in the quality of the service rendered by the road; and yet a poor road, struggling to make both ends meet, feels it necessary to charge as high rates for this poor service as it would for good. Where a road is well managed, as from the commission's opinion this one appears to be, every postponement of improvements bears on the public at least as much as upon the railroad; though it is what may be termed a partially concealed loss, and so is not realized.

Commissioner Knapp has done a good thing in seeing that both sides of this case are presented.

The Cincinnati, New Orleans & Texas Pacific, which recently announced premiums for enginemen, firemen, conductors and trackmen has, for the ensuing year, announced premiums also to station agents, those which are telegraph operators to receive \$15, those which are not \$10, and operators who are not agents receiving \$5. In awarding the premiums the Superintendent will consider neatness and cleanliness of station buildings and contents; accuracy in accounts, reports and records; promptness in answering correspondence, forwarding reports and remittances, answering telegraph calls; reporting trains, transmission of telegrams, economy in the use of supplies and a strict observance of the rules. All agents making a record of 90 per cent. of perfection will be entitled to a premium; and, in addition, the agent showing the largest percentage of increase in ticket sales, extra baggage, collections, etc., will receive \$15. It seems regrettable that the first premium could not have been made at least \$25. We fear that the enthusiasm aroused by the sum offered may be of such a moderate character as to detract materially from the success of the scheme as a whole. The prize for increase of business may, of course, go to some agent who has been fortunate without great effort, while some other one who has been specially active, with a view to getting the prize, may thus lose it in spite of his efforts.

On March 11 a special train over the Charleston & Savannah Railway was run from Central Junction, near Savannah, to Ashley Junction, near Charleston, 102 miles, in 1 hour, 40 minutes, equal to 61.2 miles an hour. The run was made for a single passenger who had to reach Charleston at a certain hour to file a bid with the government engineer officer for work in connection with the improvement at Georgetown Harbor. For a single track road, doing a light business, this is a good run as it stands; but the excellence of the per-

formance is not apparent until the fact is noted that a stop of 15 minutes was made at Ridgeland, 31 miles from Central Junction. Deducting this time, the speed through is 72 miles an hour, a rate which, we believe has not been equaled for so long a distance except perhaps in one instance, that on the Lake Shore & Michigan Southern, the run from Erie to Buffalo, Oct. 24, 1895. A further interesting fact is that the engine used on the Charleston & Savannah has driving wheels only 5 ft. 4 in. in diameter. It was No. 312, American type, built by Rogers about six years ago, and the principal dimensions are: Cylinders, 17 in. x 24 in.; weight of engine, 90,000 lbs.; weight on drivers, 57,000 lbs.; heating surface, 1,274 sq. ft.; grate surface, 17½ sq. ft. The boiler is 54½ in. in diameter and has 200 tubes 2 in. in diameter and 11 ft. long. The steam ports are 1½ in. x 16 in., and the travel of the valves is 5½ in.; outside lap, ½ in. We are not informed what made the 15-minute stop necessary. If it was not made for coal or water or for other needs of the engine, or was only partly for that purpose, it is possible that this run may rank virtually ahead of all others for such a long distance. The Lake Shore record of 72.91 was for a distance of 86 miles.

#### NEW PUBLICATIONS.

*A Historical Sketch of the American Society of Civil Engineers.* By Charles Warren Hunt, Secretary of the Society. New York: 1897; 8vo, 92 pages, with an index; full morocco, flexible, gilt, with 36 illustrations. Price \$10.

At the time of the annual meeting of the American Society of Civil Engineers last January, we announced the fact that Mr. Hunt had compiled a brief history of the Society, which had been printed by order of the Board of Direction, and which would be sold for \$10 a copy, the profits being added to the fund for building and equipping the new society house. This handsome volume is now ready for delivery, and we advise those members of the Society, and others interested in the Society, who have not already subscribed for it, to do so, for it is a compact, well arranged, fairly full, and, we must suppose, thoroughly accurate history of the society. It contains also a large number of portraits which will be of great interest to the older members, and ought to be of much interest to the younger ones.

The first part of the book is a chronological record of the establishment and building up of the Society. Probably most members will be surprised to know that the first movement to form this Society was in 1839, when a meeting was held in Baltimore at which 40 gentlemen from 11 different states were present. Of this meeting Mr. Benjamin H. Latrobe was made President, and a committee was appointed to organize the work. The effort failed, however, and contemporaneous writers say that it was a failure largely because of local jealousy.

In November, 1852, a number of gentlemen met in New York City to form the American Society of Civil Engineers and Architects, and it was decided by them to incorporate such a society. Mr. James Laurie was elected President of the new organization. The life of the society, however, was feeble and precarious, and it died out in spirit if not in form, and finally an interval of 12½ years passed between meetings, until in October, 1867, a meeting was held in New York at which were present nine charter members, and when, we are glad to observe, the minutes of the last meeting, namely, that of March 2, 1855, were read and accepted. It was decided to reconstitute the society, and an annual meeting was held the next month at which Mr. James P. Kirkwood was elected President. From this time the Society went on with a healthy, if somewhat fluctuating, life. In 1870 it had 160 members. In 1886 these had grown to 1,019, and about the end of 1896 they were 2,018.

Having given the brief chronology of the Society (51 pages of the book) Mr. Hunt takes up various special topics. First he describes the locations occupied by the Society at various periods from its little quarters in William street to the new house now building. He then briefly mentions the growth of the library; the part taken by the society in international exhibitions; the history and statistics of its publications; the history of the badge; the history of the constitutional changes, and, finally, the work accomplished in the way of papers and committee reports and discussions produced. A closing chapter gives the story of the comparative growth of the three great civil engineering societies, namely, the American Society of Civil Engineers, the Institution of Civil Engineers (British) and the Société des Ingénieurs Civils de France. The total membership of the Institution, March 31, 1896, was 6,907, and the total membership of the French society, Nov. 30, 1895, was 2,591. A diagram is given showing the rate of growth of these societies from a membership of about 250 to a membership of 2,000. They ran along pretty nearly parallel, so far as rate goes, until the membership was about 700, then the growth of the American Society was accelerated and it became considerably more rapid than that of the foreign societies, and Mr. Hunt tells us that "it is satisfactory to know that the period required to reach our present membership by each of our elders was respectively 9½ and 6 years longer than it has been in our case." To this, however, we should like to add that we hope that the governing body of the Society will always keep carefully in mind a quotation from the inaugural address of Mr. Thomas Telford, the first President of the British Institution, which appears on one of the earlier pages of the volume under review, namely, "always



keeping in mind that talents and respectability are preferable to numbers, and that from too easy and promiscuous admission, unavoidable and not infrequently incurable inconvenience perplex most societies." Knowing how true this is of societies and clubs we do not take any special pleasure in contemplating the sharp upward course of the curve of growth of the American Society of Civil Engineers and we hope that no pressure for increase of revenue will prevail with the Direction in considering the cases of candidates proposed. A very good fundamental principle for them to keep in mind is that in cases of doubt the interpretation should be for exclusion rather than for admission of a candidate. Errors made on that side are more easily corrected than errors of the other sort.

The book is beautifully printed and bound and we have said that the portraits are interesting, which is quite true. There are 35 of them, being a complete set of portraits of the presidents, and, with two exceptions, of the secretaries and the treasurers, and certainly Mr. Hunt has been remarkably fortunate in being able to collect such a set. He has not, however, been so fortunate in getting the portraits engraved and printed. Some of the results are very good, but some of them help to make us contented with never having achieved the distinction of the high office of President of the American Society of Civil Engineers.

*The Stresses in Framed Structures.* By A. Jay DuBois, C. E., Ph. D., Professor of Civil Engineering in the Sheffield Scientific School of Yale University. New York: John Wiley and Sons, 1897. Tenth Edition, XXV. + 617 pages, with 28 plates. Price \$10.

This work, having passed through nine editions under the name of "Strains in Framed Structures," has now been issued with changes so extensive that it has been practically rewritten and reset. The author has everywhere changed the word "strain" to stress, and also reversed his former signs for tension and compression. In these particulars the book now conforms to established usage, and on this account will be consulted by engineers with more ease than formerly. The signs for bending moments and stress equations are, however, still used in a contrary sense to that of general custom, since nearly all other works on bridge trusses regard a bending moment as positive, when it produces tension in a lower chord and negative when it produces tension in an upper chord. Thus the equations and diagrams of moments in this book have an awkward appearance to us, for it seems unnatural to take the moment of the left reaction as negative and the moments of the loads as positive.

Many changes and improvements have been made in both graphic and analytic analysis of stresses in common trusses. Concentrated load systems are discussed in full, since the strains (or stresses, as we must say now) due to them are generally required by specifications. The author prefers, however, the use of a uniform train-load preceded by two locomotive excesses, and this is certainly sufficient for all practical requirements, since typical locomotive wheel loads introduce a hair-splitting refinement which is unwarranted by actual conditions of traffic.

The principle of work, and particularly of least work, has lately received much attention, and has been briefly used in the books on bridges by Johnson and Bryan and by Merriman and Jacoby. Professor DuBois, however, sets it forth in much detail and uses it for many important stress determinations. The principle of least work is, in brief, that the work of resisting stresses must be the least possible consistent with equilibrium. It introduces a new condition, whereby the stresses in a double system truss or other indeterminate structure may be definitely deduced. Great care is required in its application, and the author properly remarks that the assumptions should correspond with the facts, otherwise the results are worthless. In the light of this remark it is difficult to see why the method was applied to the simple roof truss on page 182, all of whose stresses are easily found by common principles of statics. The case is that of two rafters connected by a horizontal tie and having a vertical from the peak to the tie. If a load of 1,000 pounds be applied at the peak, and the rafters be inclined 45 degs., the stress in the rafter is 707 pounds, that in the tie 500 pounds, and that in the vertical *nil*. Yet the author, by the use of the method of least work, deduces formulæ which give 242 pounds for the rafter, 171 for the tie and 658 for the vertical. These results are inconsistent with equilibrium, and hence worthless. Indeed the principle of least work has no proper application to a problem like this.

The truss of a suspension bridge is a case to which the method of least work is properly applicable, and the author discusses it at length, giving a numerical example for a span of 130 ft. to illustrate his formulæ. From this we learn that the common method of design gives a cable 47 per cent. too heavy, and a truss whose chords are far too light, the author's stresses being nearly three times as great as those found by the common method. It seems scarcely possible that our suspension bridges can be so far wrong as this example indicates, and on examining the reasoning it seems to us that the assumptions do not correspond with the facts. The cable is to carry all the dead load and part of the live load, and what proportional part it carries is to be found by the principle of least work. To do this expressions for the work of the cable, hangers and truss are written in terms of an unknown fraction, and thus formula (26) is established. Now this formula does not include the fact that the cable and hangers are already strained by the dead load while the live load is applied, and thus its first and second terms are too small. The assumptions

made do not correspond with the facts, and hence the results of the investigation cannot be accepted as reliable.

The principle of least work is also applied in the discussion of swing bridges and formulæ are deduced that have a formidable appearance. We are told, in italics, that the common formulæ for reactions and pier moments are not applicable to most practical cases. This conclusion, derived from the discussion of a swing truss of 160 ft. length with only four panels in each span and a depth of only 10 feet at the pier, is not likely to cause anxiety among bridge designers, for this is not a fair practical case. Indeed, as Turneaure has shown in a recent paper, the influence of the webbing is usually so great that the common formulæ furnish all needed precision. On the whole, this chapter on swing bridges is disappointing and not likely to increase the confidence of engineers in that new law of nature, the principle of least work.

The braced arch and the continuous girder are ably and fully treated, a numerical example of stresses in one of six continuous spans being given. For independent spans, it is said that double systems of webbing are practically antiquated, and that no more will probably be built in America. Naturally the treatment of independent spans is far more full, complete and satisfactory than that of complex structures. No special chapter is given on the cantilever bridge, although eight pages are devoted to an excellent discussion of the loadings that give maximum stresses.

An appendix to the theoretical part of the book discusses concentrated load systems and continuous girders with great fullness, and also treats of materials, flexure, torsion and columns. The table of properties of materials is largely compiled from Rankine and Stoney, authorities rather old, but Bovey, Lanza, Lovett and Wood are also cited. In this connection it seems strange that the vast number of tests made by Howard at the Watertown arsenal should have remained unnoticed. It is shown that the principle of least work is able to deduce the moments and reactions of beams fixed at their ends, although how this can be done without introducing any definition of the word "fixed" must be something of a mystery to students. Many numerical examples regarding beams, selected from Bovey, Stoney, Wood and Weisbach, are presented. Prichard's new formula for columns is given, the author remarking that it is the most important contribution to the subject since the time of Euler.

The practical part of the book, which covers pages 265-609, contains, as before, matter of much value to both students and engineers. The method of dimensioning by the use of maximum and minimum stresses, due to Weyrauch and Launhardt, is presented in detail; it is to be regretted that the Greek letters used by these writers were not replaced by Latin ones. Valuable tables for columns, rivets, stringers and other bridge members are given. Cooper's specifications of 1896 are printed in full, with annotations. The complete computations for an iron railroad bridge of 153 ft. span, designed and erected by Kellogg & Maurice, are presented with several plates of working drawings. The author remarks that it is impossible to keep pace with the changing details of practice and that permanent principles of design are of greatest value to students. This is undoubtedly true, and from this point of view the chapter on order books and shipping lists might well have been omitted, as their arrangement differs much in different bridge offices. The excellent chapter on "Erection," by John Sterling Deans, Chief Engineer of the Phoenix Bridge Co., of especial value to railroad engineers, has been reprinted with but few changes. A new and important chapter is that on "Modern High Buildings," by William W. Crehore, which fully treats of the different systems of floors, columns, and wind bracing used in these structures, and also gives a handy classified list of references to articles in engineering periodicals.

Notwithstanding that we have felt obliged to point out errors committed by the author in using the principle of least work, we have a high opinion of the value of this book. Its many excellencies far outweigh its few defects, and in its revised form it stands as a witness for the industry, energy and ability of the author. Originally published in 1883 it has for 14 years exerted much influence, especially in introducing European theories of investigation, and in its new dress is likely to be of still greater value to students and bridge engineers.

#### TRADE CATALOGUES.

*Snatch Blocks and Sheaves.*—The Bagnall-Loud Block Co., 162 Commercial street, Boston, sends us circulars concerning Ferrall's patent self-raising iron snatch block and Ferrall's patent long-bearing self-adjusting, 5-roll sheave, of both of which it is the sole maker.

The company's latest improvement in snatch blocks consists in having both cheeks of the same height, doing away with the link, and shortening up the block. The two sides being smooth, they cannot chafe the rope, as in the old-style blocks where the link is used. In this snatch block there are two springs through the end piece at the bottom. When the side is pulled out to admit the rope, it flies back again when released, and thus automatically closes the block. Both ends of the block have a rigid separator, so the cheeks cannot close together on the sheave, as in the old snatch blocks. The idea is said to be new.

The five-roll sheave has a long bearing, the rolls extending the whole thickness of the sheave. These rolls

are slotted in the center, and run on an interior rail. They also have a separator to keep them apart. The box that holds the rail is divided laterally, and is interlocked on both sides. It also has lugs to prevent the bushing from turning in the lignum vite sheave, a feature entirely new in roller bushings.

Another new device is the company's patent galvanized-iron sheave, fitted with a composition box for the steel rolls to run in. These sheaves are also made with six rolls. The circular regarding the five-roll sheave contains a price list.

*Black Diamond Express* is the name of a handsome advertising pamphlet which the General Passenger Agent of the Lehigh Valley now issues quarterly, the March issue being Number 1. It tells about the scenery along the Lehigh Valley road and has an essay on whist-playing, in which the reader is soberly reminded that there is no use in trying to play on Lehigh Valley trains, except after dark, the scenery is so sure to distract attention by its marvelous beauty. There is a list of several fast runs made by the Black Diamond Express when it has been behind time; one of these shows 79 miles an hour for 38 miles. Verily, our railroad press agents are coming to be very expert in handling the locomotive.

*Lägerdorfer Portland Cement.*—The Kelley Island Lime and Transport Co., Cleveland, O., sends us its catalogue of Lägerdorfer Portland cement, Eiffel Tower brand, for which the company is the sole agent for the United States. The catalogue is standard 6 x 9 in., printed on good paper, and neatly bound. It contains over 30 full-page half-tone illustrations, representing works in which this cement has been used. Besides the illustrations the book also contains data and other matter of interest.

#### Valves of the Corliss Type on Locomotives in France.

In a summarized translation from *Les Annales des Mines*, December, 1895, of a paper by Mr. Ernest Polonceau, Chief Engineer, Paris & Orleans Railroad, appearing in a recent number of *Engineering* (London). Mr. B. Donkin states that for several years Mr. Polonceau has made use of a system of four valves of the Corliss type on the locomotives of the Paris Orleans. The system is that patented by Durant and Lencave, and consists in making the two rods, driving the admission and exhaust valves, work in the same guide, and connecting them with each other by reversing links which are actuated by the same reversing shaft. Each cylinder has four cylindrical valves of the Corliss type, two for admission, two for exhaust. By placing them at the extreme ends of the cylinder, the clearance space is reduced to 4% or 5 per cent. of the piston displacement. Both sets of valves, admission and exhaust, are double-ported.

This new system of Corliss valves and gear has the following advantages:

1. The steam before entering the cylinder is not so much cooled as in ordinary engines, because the steam chest and valves are not chilled by the passage of the exhaust steam through them. The temperature of the latter is about 230 deg. Fahr., while that of the steam chest is 375 deg. Fahr. Thus, in ordinary engines with a single valve, there is a certain amount of condensation, which does not occur in the engines with four Corliss valves.

2. There is not the same loss in steam pressure during admission, because the steam enters through ports of about double the usual area.

3. The expansive force of the steam in the cylinder is better utilized, because the clearance space is smaller, the period of compression is shorter, and of expansion longer, all conditions telling in favor of the new valve gear.

4. When reversing the valves, the power developed to stop the engine is greater, because the quantity of steam filling the clearance space is less, and the exhaust valve has a lead.

5. There is less valve friction, and the four valves being nearly balanced, do not absorb as much power as one ordinary valve.

6. The two exhaust valves being at the bottom of the cylinder, the water escapes through them by gravity, and the cylinder drain cocks are seldom required.

Locomotives fitted with this valve gear have done remarkably well when attached to express trains attaining a maximum speed of 62 miles an hour, and have proved their superiority to ordinary locomotives, both in starting easily and in getting up speed. Their behavior was especially noted when running up the Etampes gradient (Paris-Orleans Railway), a five mile incline of about 1 in 125, when they attained a speed of 4½ to 5 miles in excess of the ordinary locomotives, with a load varying from 148 to 190 tons.

After running 40,200 miles a locomotive with the Corliss valves was taken to the Paris workshops in December, 1892, for inspection and repair, and it was found that there was practically no wear of the steam and exhaust valve cases. The valves themselves were a little worn, but their surfaces were in good condition. The cranks driving the valve-shafts were rather loose on their square seats, but all the pins of the connecting-rods, cranks, and levers of the valve gear were practically intact. The eccentric straps were exposed to the same wear as in ordinary locomotives. The only special repair required for the mechanism of the new gear was



to tighten the square valve-shafts on their seats. After these 40,200 miles, the valves, etc., were in such good condition that the engine was returned from the workshops without any repairs. With ordinary French locomotives, the valves have, as a rule, to be inspected after a run of 12,500 to 17,500 miles, and both valves and chests have usually to be planed each time. It is very seldom that this overhauling can be dispensed with.

Comparative tests were made on a locomotive with four cylindrical valves and one with ordinary valves, each with cylinders 17½ in. in diameter by 26-in. stroke, running 24 express trains apiece between Paris and Orleans, 75½ miles, and back.

As a result of the 24 experiments on each of these engines, the water consumption per drawbar horse-power per hour, as indicated by the dynamometric cars used in the tests, was in the case of the Corliss locomotive with four valves 11.19 per cent. less than in the locomotive with the ordinary slide-valves.

The new system has also the advantage of allowing the locomotive to run at a higher speed. With the Corliss locomotive the train attained its normal speed more quickly than with the ordinary locomotive. In the case of trains which were more than three minutes late, the Corliss engine made up more time than the ordinary locomotive. The gain generally was from two to five minutes between each of four stations at which stops were made. Between Bretigny and Les Aubrais, with an average load of 167 tons, it often attained 67 miles an hour, a speed never equalled by the ordinary locomotive with the flat slide valve.

In a comparison of the results obtained from the indicator diagrams measuring the indicated work done in the cylinders of these two locomotives it appears that the economy of the Corliss over the ordinary locomotive was:

16.25 per cent. per driver revolution, when the work done varied from 31,102 to 38,336 ft. lbs.  
10.8 per cent. per driver revolution, when the work done varied from 38,336 to 47,015 ft. lbs.  
9.2 per cent. per driver revolution, when the work done varied from 47,015 to 72,331 ft. lbs.

An average of 169 diagrams shows a percentage of saving in feed water effected by the Corliss over the ordinary locomotive of 10.45.

Indicator diagrams, taken under similar working conditions, on the two different kinds of locomotives, show a fuller card with better defined point of cut-off and less compression in the Corliss engine, with a cut-off at 10 per cent. of stroke, throttle four-fifths open, than in the ordinary engine with cut-off at 15 per cent. of stroke and throttle fully open.

The above results agree with those obtained with the dynamometric cars; the latter show an economy of 11.19 per cent. of feed water with the Corliss, as compared with the ordinary locomotive for one entire run, the quantity of steam admitted in the cylinder being larger or smaller. As already noticed, it is only in the latter case that an appreciable economy is obtained, since with a small quantity of steam admitted in the cylinders and of work done, there is a gain of 16.25 per cent. in the Corliss valves, as shown by the indicator diagrams.

Mr. Donkin points out that the author draws attention to one important fact.

The above experiments were made with a boiler carrying steam at 10 atmospheres pressure. As much higher pressures are now usual, the economical results obtained with the Corliss gear ought to be, and would certainly be, still better. If the results arrived at when working with steam at 10 atmospheres pressure be compared with others calculated for a pressure of 15 atmospheres, the economy effected with the higher steam pressure would work out at 14 to 15 per cent. greater than with the pressure of 10 atmospheres here considered.

The horse-power obtained from the hook of the tender drawing the train was measured by means of a special dynamometrical car. This horse-power represents about 71 per cent. of the tangential work on the driving wheels of the locomotive. This work on the circumference of the driving wheels is 85 per cent., on an average of the indicated work, as shown by the diagrams, or, in other words, the mechanical efficiency of the engine is 85 per cent. If the work from the drawbar be compared with the indicated horse-power from the diagrams, the former is 60 per cent. of the latter. This figure has, it appears, been confirmed by various trials in France.

For the Corliss engine the consumption of water per hour per drawbar horse-power is 47.4 lb. After deducting 15 per cent. for the continuous steam air pump for the brakes, the injector, and the water for wetting the fuel, it equals 40.3 lbs., which when multiplied by 60 per cent., the consumption of steam or feed water per indicated horse-power per hour, comes out 24.18 lbs.

For the ordinary engine the consumption of water per horse-power on the drawbar is 52.8 lbs., and treating this in the same way as above the consumption comes out 26.94 lbs. of feed water per indicated horse-power per hour.

In the case of the Corliss engine, the dynamometer horse-power is 299; this is equivalent to 498 indicated horse-power, i. e., 60 per cent. of 498 indicated horse-power is 299 dynamometer horse-power. With the ordinary locomotive the dynamometer horse-power equals 269, which is equivalent to 448 indicated horse-power.

The calculations of work done and quantity of steam used per stroke, as shown by the indicator diagrams, from the volume and pressure of the steam up to cut-off in the cylinders in the usual way, allowing five per cent.

clearance space in the Corliss and 9.5 per cent. in the ordinary locomotive, show as an average of 169 cards that the Corliss used 0.422 lb. steam per stroke and did 113,715 ft. lbs. of work per pound of steam, while the ordinary used 0.464 lb. steam per stroke and did 102,954 ft. lbs. of work per pound of steam. The average drop in steam pressure between that of the boiler and maximum pressure shown on the diagrams, when the throttle was fully open and the locomotive going at 49.7 miles per hour, is 10 lbs.

In these tests the stokers, engine-drivers, steam engine indicators and dynamometrical cars, were constantly changed during the various runs between Paris to Orleans and back with these two locomotives, so as to minimize errors as far as possible.

Some 17 locomotives are now working with the system of four Corliss valves to each cylinder on the Paris & Orleans and other railroads in France.

#### A Wheel-Dressing Machine.

At the meeting of the Canadian Society of Civil Engineers held Jan. 7, in a paper on "A New and Cheap Method of Dressing Car Wheels, Axles, etc.," Mr. R. Atkinson described the Sibbald dresser and the method by which the machine does its work. The description of the machine was given as follows: A ring about 33 in. in diameter of mild steel (of about .65 per cent. carbon) is fixed like the tire of a locomotive driving wheel on a suitable center, which is mounted on a heavy shaft, and has its periphery turned to produce the proper profile on the wheel to be operated upon, and very carefully balanced. The disk thus formed is driven at a speed of about 3,000 revolutions per minute. The wheel is set in a suitable carrier and is revolved slowly, about two or three revolutions per minute, so that the surface when brought against the operating disc will move in an opposite direction. The wheel and disc are then pressed together with a force sufficient to cause friction enough to consume a great part of the power which is driving the disk, and thus convert the power into heat. The disk cuts or rubs off the metal of the wheel operated upon, and leaves a smooth finished surface, which by the pressure and heat is closed and hardened to a considerable degree and to a depth of 100th of an inch or more depending on the grade of the steel worked upon.

The principal constructive feature in the machine itself is the manner in which the friction on the journals of the disk, which would result from the combined great pressure and high speed, is overcome by a system of forced lubrication, carried out by pumping oil into the bearings at the point of contact, thus causing the shaft to revolve upon a film of oil which flows out at the ends where it is collected by centrifugal force and returned to the pumps.

A crude type of the machine thus described was in operation in May, 1886, at the works of Mr. W. G. Miltimore, at Arlington, Vt., where it was used to dress cast-iron car wheels. A heavier and improved machine was afterward built by Messrs. J. Laurie & Bro. and operated in a shed at the old Canadian Pacific works at Hochelaga. In this case the source of power was not at all satisfactory, for when it is considered that from 100 H. P. to 300 H. P. is required, there is obvious necessity for both reliable and economical motive power.

In the latest form of this machine, as operated at the works of Messrs. Easton, Anderson & Gooden, Erith, Kent, it was found that by sending an electrical current through the point of contact of the fusing disk and wheel, so as to heat the wheel at that point, a very great reduction in the power could be made, or much more material removed by the same power in a given time.

In the operation of the machine at Hochelaga it was shown that with proper arrangements for power and handling, only two men are required to work it. One of these will operate the machine and the other the engine.

The output of wheels would vary with the condition of the tread from six pairs a day when the flanges are bad, and say 12 in. has to be taken off the tread, to 20 pairs that have not been allowed to get into bad shape. The saving in the cost of dressing by this machine over the cost of turning is estimated to be from 27 per cent. on average wheels to at least 50 per cent. on those requiring less work.

The gain in the mileage life of tires dressed by this process is thought to be considerable, for when the disk cuts or rubs off the heated metal, it leaves a smooth hard surface. The hardening effect depends upon the percentage of carbon in the metal being worked and the manner of handling varying from 1/16 in. to 1/8 in. in depth. The process is peculiarly well suited to finishing and hardening journal surfaces where the journals are subjected to considerable pressure and speed.

#### New Locomotives for the Danish State Railroads.

In a recent number of the *Organ für die Fortschritte des Eisenbahnwesens*, there is a detailed description of two types of locomotives lately brought out by Herr Busse, "Maschinen-director" (Superintendent Motive Power) of the Danish State railroads, at Copenhagen. One of these is designed for fast passenger trains, and the other for local service. The express locomotive is of the eight-wheel American type, with a four-wheel truck, equalized in a manner similar to our own practice. The driving wheels are also equalized together, and the springs underhung. The boiler is of the plain straight top form, with the flat crown sheet sup-

ported by screw stays. It has a deep firebox between the driving axles, which are spaced 8 ft. 6½ in., center to center.

The general appearance of the engine is quite good, with the exception of the valve gear, which is mounted entirely outside of the frames. It is so arranged, in conjunction with an inclined valve face and stem, as to obviate the use of a rocker. To set the eccentrics, however, on a shaft at the end of a crank outside of the main rod is a practice that was never common in this country, and, in fact, has been long since abandoned. Stroudley's speed indicator is used, and, according to the testimony of railroad men in Denmark, appears to give great satisfaction. Among other features of this engine is the inclined valve-seat and stem, alligator crosshead with two-bar guides, and screw reversing gear. A six-wheel tender is used, as is common on European railroads, with rigid wheel base 3.2 meters (10 ft. 5½ in.) long.

The other type of locomotive, that for local passenger service, is a tank engine, four-wheel connected, with pony two-wheel truck under each end. It has side tanks as well as a small one adjoining the coal bunker back of the cab. The details are about the same as those of the express locomotive, with the exception of the crosshead, which on the local engine is of a simple block form, using only a single guide bar. The boiler is practically the same size as that of the other engine, and of the same type. Weights and principal dimensions of both types follow:

#### EXPRESS LOCOMOTIVE.

Total weight in working order.....	42,000 kg.	= 92,610 lbs.
Weight on driving wheels.....	26,000 kg.	57,350 lbs.
Weight on truck.....	1,000 kg.	2,200 lbs.
Diameter of boiler.....	1,244 mm.	49 in.
Number of tubes.....	172	
Length of tubes.....	3,430 mm.	11 ft. 3 in.
Diameter of tubes.....	48 mm.	1½ in.
Area of grate.....	1.77 sq. m.	19.05 sq. ft.
Firebox heating surface.....	9.25 sq. m.	99.57 sq. ft.
Heating surface of tubes.....	78.76 sq. m.	847.77 sq. ft.
Total heating surface.....	88.01 sq. m.	947.34 sq. ft.
Steam pressure.....	12 atmospheres	176.4 lbs. per sq. in.
Diameter of cylinders.....	430 mm.	16½ in.
Stroke of cylinders.....	610 mm.	24 in.
Diameter of driving wheels.....	1,816 mm.	71½ in.
Diameter of truck wheels.....	914 mm.	36 in.
Total wheel base.....	5,850 mm.	19 ft. 2½ in.
Rigid wheel base of drivers.....	2,690 mm.	8 ft. 6½ in.
Truck wheel base of drivers.....	1,800 mm.	5 ft. 10¾ in.
Weight of tender empty.....	18,800 kg.	40,429 lbs.
Water.....		2,657 gals.
Coal space.....		123.6 cu. ft.

#### LOCOMOTIVE FOR LOCAL TRAFFIC.

Total weight in working order.....	52,000 kg.	114,660 lbs.
Weight on driving wheels.....	26,500 kg.	58,382 lbs.
Weight on forward pony axle.....	13,100 kg.	29,665 lbs.
Weight on rear pony axle.....	12,500 kg.	27,562 lbs.
Diameter of boiler.....	1,352 mm.	53 in.
Number of tubes.....	140	
Length of tubes.....	3,445 mm.	11 ft. 3½ in.
Diameter of tubes.....	48 mm.	1½ in.
Area of grate.....	1.31 sq. m.	14 sq. ft.
Fire box heating surface.....	8.05 sq. m.	86.65 sq. ft.
Heating surface of tubes.....	64.42 sq. m.	693.4 sq. ft.
Total heating surface.....	72.47 sq. m.	781 sq. ft.
Steam pressure.....	10 atmospheres	147 lbs. per sq. in.
Diameter of cylinders.....	430 mm.	16½ in.
Stroke of cylinders.....	610 mm.	24 in.
Diameter of driving wheels.....	1,710 mm.	67 in.
Diameter of truck wheels.....	1,100 mm.	43 in.
Total wheel base.....	6,430 mm.	21 ft. 9 in.
Rigid wheel base of drivers.....	2,430 mm.	7 ft. 11½ in.
Truck wheel base of drivers.....	1,800 mm.	5 ft. 10¾ in.
Water.....		1,564 gals.
Coal.....	2 T.	4,410 lbs.

#### TECHNICAL.

##### Manufacturing and Business.

The firm of Aquila Rich & Co., of New York City, sole agents for the United States, Canada and Mexico of steel wool, a product used in place of sand paper, pumice stone, etc., for rubbing down and polishing all kinds of woodwork and metal, has consolidated with F. O. Pierce Co., of New York City. The officers of the new company are: President, Frederick O. Pierce; Treasurer, Malcolm Graham, Jr., and Secretary, Arthur P. Ripley.

Henry J. Davis has been appointed to represent the Dickson Mfg. Co., of Scranton, Pa., in New York City, with office at 100 Broadway. Mr. Davis was at one time Assistant Superintendent of the Delaware, Susquehanna & Schuylkill Railroad.

Robert W. Hunt & Co., The Rookery, Chicago, have received an order to inspect the material and construction of the 21 locomotives purchased by the Mexican Central from the Brooks Locomotive Works, Dunkirk, N. Y. This is the second locomotive inspection order received by that firm from the Mexican Central, it having lately completed the inspection of five locomotives at the same works. The company is also inspecting the material and construction of 50 cattle cars for the San Francisco & San Joaquin Valley Railroad, and 180 freight cars for the Colorado Midland, now being built by the Pullman Palace Car Co.

The annual meeting of the O'Neil Crossing Alarm Co., The Rookery, Chicago, held last week, resulted in the election of the following directors: W. P. Johnson, W. D. Drake, A. L. Dunbar, James T. Gardner and S. P. Austin.

The Chauncey Tapestry Co., of Chauncey, N. Y., has recently purchased the plant of the Brussels Tapestry Co. of that place, and will continue the operation of the works. One of the specialties of the Brussels Tapestry Co. was the "Perfect" self-adjustable curtain fixture for cars.

The Ingersoll-Sergeant Drill Co., Havemeyer Bldg., New York City, which recently received an order from Atchison, Topeka & Santa Fe for a large duplex air compressor to be used in the shops of the Gulf, Colorado & Santa Fe at Galveston, Tex., has just received an order

\* See Railroad Gazette, May 27, 1887.



for a duplicate for that road. The air cylinders of these compressors are cross compound and of the well-known piston inlet type.

#### Iron and Steel.

The Juniata Furnace & Foundry Co., at Newport, Pa., has resumed operations after an idleness of over a year. The company has orders on hand which are expected to keep it employed the rest of the year.

The Cambria Iron Co. has bought a half interest in the Mahoning iron mine, in the western Mesaba district.

The American Tin Plate Co. proposes adding four more mills to its plant at Elwood, Ind., making it a 20 plant mill. It is expected that 400 more men will be employed.

The puddlers of the E. & G. Brooks Iron Co., who have been idle since last November, on account of a reduction in wages, have accepted the new rate and returned to work.

The two new tin mills of the New Castle Steel & Tin Plate Co., at New Castle, Pa., have been completed and put in operation.

#### New Stations and Shops.

The new passenger station of the Erie at Middletown, N. Y., was opened to the public on March 24.

A new joint depot will be built by the Cincinnati, Hamilton & Dayton and the Lake Erie & Western at Lima, O. Plans for the building have not yet been determined upon.

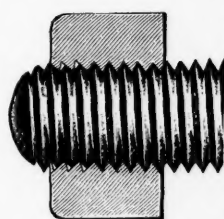
The shops of the Cincinnati, Hamilton & Dayton at Lima, O., which were reported destroyed by fire, will be rebuilt, the \$33,000 bonus asked for by the railroad having been raised by the citizens of Lima by subscription.

It is reported that the Southern Railway has contracted with Lane Bros., of Scottsville, Va., for a roundhouse at Greenville, S. C., having a capacity for 50 locomotives.

The Grand Rapids & Indiana proposes building a new freight house at Grand Rapids, Mich. Plans and specifications are now being prepared.

#### A New Track Bolt.

The Oliver Iron & Steel Co., Pittsburgh, Pa., has recently put on the market a combination nut and bolt, which it calls the Hold Fast Grip Nut Track Bolt. The arrangement is simply a nut, a portion of whose thread is cut at a different angle from the greater part of the thread, and a bolt, threaded in the usual manner.



The bolt thread is made to the U. S. standard, as is also the thread of the nut, with the exception of the part cut to ratchet form, as shown. The locking is effected by the mere turning of the last three threads at a slightly different angle, which results in a grip which requires considerable effort to overcome. No element of strength is sacrificed in this nut and bolt, and the makers claim for it strength and simplicity.

#### A Large Elevator.

The city of Philadelphia has received bids for a car lift to be built in connection with the Reading subway. The lift is to accommodate manufacturing establishments on Pennsylvania avenue, and will be located at Seventeenth street, on the south side of the avenue. It is to be large enough to lift a locomotive and three cars. The following bids were presented: Stokes & Parrish, Philadelphia, hydraulic, \$95,425; Camden Iron Works, Camden hydraulic, \$77,000; William Sellers & Co., Philadelphia, electric, \$75,110; Sprague Elevator Company, New York, two bids, electric, five panels, \$48,350; three panels, \$44,750. The Public Work Department will examine into the merits of the apparatus of the respective bidders before making an award.

#### Two Recent Brown & Sharpe Tools.

The Brown & Sharpe Mfg. Co., Providence, R. I., has recently added to its long list of tools an improved universal bevel protractor and a lathe test indicator. In its uses, the bevel protractor is practically unlimited. It is adapted to all classes of work where angles are to be laid off or established, and as the dial is accurately graduated and the alignments correct, accurate measurements can be obtained. The dial is graduated in degrees the entire circle, but  $\frac{1}{2}$  and  $\frac{1}{4}$  degrees can be easily estimated, and when set can be rigidly clamped by a thumb nut. The protractor is made with blade either 6 or 12 in. long. The lathe test indicator is new in design and is for use in setting centrally any point or hole in a piece of work to be operated upon in a lathe or upon a face plate. It is adapted for testing lathe centers, shafting, or other work held between centers, the inside or outside of cylinders, pulleys, etc., and all work of a similar class. The tool is made of steel, and is of such a size as to be held in the tool post of a lathe. The bar is formed at the end to receive a universal joint for supporting the finger holder. A clamp nut is provided for clamping the joint when it is desired to have only a vertical movement of the finger. The bushing, which holds the finger, is split, thus allowing the finger to be adjusted to lengths required, and clamped in position. A helical spring is provided for holding the finger against the work with an even pressure.

#### THE SCRAP HEAP.

##### Notes.

The Chicago St. Paul, Minneapolis & Omaha has issued orders that uniforms shall be worn by all employees, including station agents and telegraph operators.

The Chicago, Rock Island & Pacific now serves meals in dining cars by the card instead of on the former plan of a fixed rate for each meal. A similar change has been made on the Erie, except for dinner, which is still served at the uniform price of \$1.

The Executive Council of Iowa has completed the assessment of railroads for taxation for the year 1897. The total assessment is \$44,456,197. On 17 roads there has been an increase aggregating \$856,543; on 12 roads there has been a decrease aggregating \$781,551, making a net increase of \$74,986. The decrease has been chiefly on the main lines of the larger roads, while the increase is found on a large number of small roads.

The Governor General of Canada, in his speech at the opening of Parliament, March 25, said that the enlargement of the St. Lawrence Canal ought to be carried out as rapidly as possible. The government had prepared contracts looking to the completion of the work by the close of 1898. The government has also made arrangements, subject to approval by Parliament, to allow the Intercolonial Railway to reach Montreal. To aid the farmers in sending perishable produce to England the government has made contracts for the construction of cold storage buildings or rooms at railroad stations and wharves and on steamers.

#### An Umpire for a South American Road.

In accordance with the terms of an agreement entered into between the government of Colombia, S. A., and James L. Cherry, the representative of the Cauca Railway Co., which is operated in Colombia by a New York company, Secretary Sherman has named Prof. L. M. Haupt, C. E., of Philadelphia, as the third member of an Arbitration Board to pass on the claims to indemnity of the railroad for the use of its property by the Colombia government. The company had previously named one person and the Colombia government another. Mr. Haupt is to act as umpire between these two parties in case of a disagreement. The railroad is chartered in New York state.

#### Master Mechanics' Association Scholarships.

There will be two vacancies in the association scholarships at the Stevens Institute of Technology, at the close of the present college year in June. Sons of members of the association who are eligible for these scholarships, and who desire to attend the preliminary examinations, should apply to the secretary, and, if found eligible, he will give a certificate to that effect for presentation to the school authorities, which will entitle the candidate to attend the preliminary examinations. These examinations will begin at the Institute on June 4, and continue until June 10. When it is desired, the school authorities will arrange for the examination of an applicant at any of the large cities of the country, but in that case the applicant must pay the Institute a fee of \$10, to cover the additional cost of conducting the examination there. If more than one candidate for each vacancy passes the preliminary examination the applicant passing the highest examination will be entitled to the scholarship. The school authorities settling the question. Successful candidates are required to take the course of mechanical engineering.

#### LOCOMOTIVE BUILDING.

The Lehigh & New England has received one new engine from the Rogers Locomotive Co.

The Ulster & Delaware last week received a new passenger engine from the Schenectady Locomotive Works.

The Chicago, Hammond & Western Railroad will shortly order four locomotives. This is in addition to the order for two referred to in our last issue.

The Pittsburgh, Bessemer & Lake Erie has ordered nine mogul locomotives, dividing the order equally among the Brooks, Pittsburgh and Baldwin locomotive works.

The Cooke Locomotive & Machine Co., Paterson, N. J., has received an order from the Southern Pacific for five heavy 10-wheel passenger engines with cylinders 20 x 26 in. These are to be duplicates of a large number previously built for the road.

The Louisville, New Albany & Chicago has placed an order with the Brooks Locomotive Works for four locomotives. Two of these will be 8-wheel passenger engines with cylinders 18  $\frac{1}{2}$  x 24 in., 72-in. drivers, 62-in. boiler, and with a total weight in working order of 109,000 lbs. The other two will be 10-wheel freight engines, with 18 x 24-in. cylinders and 50-in. drivers.

The Brooks Locomotive Works have an order to build one switching engine for the Buffalo Creek Railroad, with cylinders 20 x 24 in., a duplicate of one furnished last year, and for one mogul engine, with 18 x 26-in. cylinders, for the Buffalo, St. Mary's & Southwestern. The company has recently shipped two engines to the same road and also one four-wheel switching engine to the Buffalo, Rochester & Pittsburgh.

The Rutland Railroad has placed an order with the Schenectady Locomotive Works for two 8-wheel passenger locomotives. They will have 18 x 24-in. cylinders, 190 lbs. steam pressure, 69-in. driving wheels with cast-steel centers, 33-in. truck wheels, steel tired with wrought-iron centers, and 36-in. No. 1 Krupp tender wheels. The engines will be equipped with the latest improved Westinghouse brake for train and drivers, air train signals and steam heat.

#### CAR BUILDING.

It is stated that the Ohio Falls Car Manufacturing Co., of Jeffersonville, Ind., has received an order from the Mather Stock Car Co. for 50 stock cars.

The Maryland Steel Co., of Sparrow's Point, Md., has placed an order with the Weimer Machine Works Co., of Lebanon, Pa., for three 200 cu. ft. patent cinder cars.

The Schoen Pressed Steel Co., of Pittsburgh, Pa., has received the contract to build 600 steel cars for the Pitts-

burgh, Bessemer & Lake Erie. The order is referred to in another column.

The Rio Grande Western has placed an order with the Ohio Falls Car Manufacturing Co. for 100 coal cars of 30 tons' capacity and 100 stock cars. The cars are to be equipped with Westinghouse brakes.

It is stated that the City electric railroad of Louisville, Ky., is in the market for 50 new cars.

The J. G. Brill Co., of Philadelphia, Pa., is completing an order of 50 passenger cars for the Consolidated Traction Co., of Newark, N. J. They are being equipped with G. E. 1,000 motors.

#### BRIDGE BUILDING.

**Bellaire, O.**—The Board of United States Engineers, to whom has been referred the location of the piers, approaches, etc., of the proposed highway bridge over the Ohio River between here and Benwood, W. Va., has issued notice that it will be ready to hear from interested parties next month, at Bellaire. The exact date will be announced later.

**Bement, Ill.**—Bids are asked until April 9 for a 65 ft. steel highway bridge on masonry substructure. Ira O. Baker, Consulting Engineer, Champaign, Ill.

**Chattanooga, Tenn.**—Plans have been prepared by the County Engineer for an iron and steel bridge to be built at Sale Creek, to cost about \$2,000.

**Columbia, Ala.**—The heavy rains have washed away and destroyed several bridges along the Chattahoochee River. New iron bridges will have to be built at Woods' Mill and at Taylor's Mill.

**Columbia, S. C.**—A company has been formed to build an iron and steel toll bridge across the Congaree River from this place to Brookland, S. C. Among the incorporators is John T. Duncau, who can be addressed at this place.

**Cumberland, Md.**—The George's Creek & Cumberland is making preparations to replace the present wooden trestle over Clise's hole with a modern steel structure.

**Fulton, N. Y.**—Governor Black has signed the bill appropriating \$30,000 for a canal bridge at this place.

**Geneva, Ala.**—Recent floods have swept away many bridges in Coffee County and 12 bridges have been washed away in Barbour County.

**Kopperl, Tex.**—Two bridges at this place, one at Blum, one at Morgan, one south of Alvarado and a number of small bridges have been swept away by the swollen streams.

**Loveland, O.**—At a recent joint session of the boards of commissioners of Hamilton, Clermont and Warren counties, it was decided to build a new bridge over the Miami River at this place at a cost of \$44,947, of which Clermont County will pay \$3,777, Warren \$2,560 and Hamilton \$38,610. The letting of the contract and supervision of the work was left to the Commissioners of Hamilton County under the direction of their engineer.

**Lowhill, Pa.**—The County Commissioners were here recently to locate two iron bridges that are to be built over Jordan Creek, in this township. The contract will shortly be awarded. One of the bridges is to be 72 ft. long, and the other 137 ft.

**Montoursville, Pa.**—The County Commissioners and the promoters of the Montoursville trolley line are figuring on what proportion of the cost of the new bridge across Loyalsock Creek should be paid by the latter. No conclusion has yet been reached, but it is thought that an understanding will take place very shortly.

**Newport News, Va.**—At the last meeting of the council, the measure to build an overhead bridge at the Twenty-eighth street crossing over the Chesapeake & Ohio was defeated, but the City Engineer was instructed to prepare plans and specifications for three bridges, half the expense of the bridges to be payable by the Chesapeake & Ohio, and the other half by the city.

**New York.**—The Governor has signed the bill authorizing this city to expend a sum not to exceed \$100,000 for the construction of a bridge of a single span of 40 ft. across the Harlem River to provide for the extension of Broadway or Kingsbridge road.

**Omaha, Neb.**—The Burlington will widen its bridge over 7th street so that it will accommodate several more tracks, this being done to convenience roads desiring to use its new passenger station. The Union Pacific will also widen its bridge over the same street, so that the two will be practically one.

**Rutland, Vt.**—The Rutland road has contracted with the Edge Moor Bridge Works, Edge Moor, Del., for three new steel bridges to be placed at Proctorsville, Chester and Rockingham.

**Springfield, O.**—Bids will be received until April 19 for a 120-ft. steel bridge in Snyder Park. D. F. Snyder, City Engineer.

**Strathallan, Ont.**—Tenders are being received by Mr. James Anderson, Clerk East Zorra, Strathallan, for the erection of a steel highway bridge in the township of Zorra, site four miles from Strathallan station, on the Grand Trunk. Length of bridge over all, 70 ft., in one span; width of floor, 14 ft. Tenders to be accompanied with sketch of bridge and load it is designed to carry.

**Valdosta, Ga.**—Many bridges in Lowndes County have been carried away by the freshets. A number of bridges on the Flint have been carried away.

**Wyoming, Pa.**—Plans are being prepared for a steel bridge across the Susquehanna River from this place to Port Griffith. The company has been chartered. Among those interested in the enterprise and whose names appear as incorporators are A. L. Lindsay and W. R. Chapin, of Wyoming. N. B. Rutter is the engineer. The length of the bridge will be about 1,810 ft., and it will be composed of five spans. The bridge will have a roadway of 20 ft. in width and sidewalk 6 ft. wide, and another passageway 12 ft. in width.

#### MEETINGS AND ANNOUNCEMENTS.

**Dividends.**  
Dividends on the capital stocks of railroad companies have been declared as follows:

*Chartiers*, 5 per cent., payable April 1.



*Chicago & Eastern Illinois*, quarterly, 1½ per cent. on preferred stock, payable April 1.

*Chicago, Rock Island & Pacific*, quarterly, 1½ per cent., payable May 1.

*Cincinnati, Hamilton & Dayton*, quarterly, 1 per cent. on preferred stock "A" and "B," payable April 6.

*Dayton & Michigan*, quarterly, 1½ per cent. on common stock, payable April 1, and quarterly dividend 2 per cent. guaranteed on preferred stock, payable April 6.

*Delaware, Lackawanna & Western*, quarterly, 1½ per cent., payable April 24.

*Southwest Pennsylvania*, 5 per cent., payable April 1.

*Sunbury & Lewistown*, 4 per cent., payable April 1.

*Utica & Black River*, 3½ per cent. on guaranteed stock, payable March 30.

*Metropolitan Traction Co.*, New York, quarterly, 1½ per cent., payable April 15.

*National Railway of St. Louis*, quarterly, 1½ per cent., payable April 6.

#### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Canadian Southern*, annual, St. Thomas, Ont., April 7.

*Catawissa*, annual, 237 South Third street, Philadelphia, April 6.

*Central Pacific*, annual, San Francisco, Cal., April 13.

*Chicago & Alton*, annual, Chicago, Ill., April 5.

*Joliet & Chicago*, annual, Chicago, Ill., April 5.

*Lake Shore & Michigan Southern*, special, Cleveland, O., and Erie, Pa., May 20.

*Mexican International*, annual, New Haven, Conn., April 10.

*New York Central & Hudson River*, annual, Albany, N. Y., April 20.

*Pittsburgh, Cincinnati, Chicago & St. Louis*, annual, Penn avenue and Tenth street, Pittsburgh, Pa., April 13.

*Southern Pacific Co.*, San Francisco, Cal., April 14.

*Union Pacific*, annual, Boston, Mass., April 28.

*West Shore*, annual, Albany, N. Y., April 21.

#### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Railway Association* will hold its convention at Richmond, Va., on April 7, 1897.

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Association of American Railway Accounting Officers* will hold a convention at Richmond, Va., on May 26, 1897.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Association of Railroad Claim Agents* will hold their next meeting at the Southern Hotel, St. Louis, May 26, 1897.

The *Association of Railway Claim Agents* will hold its convention at St. Louis, Mo., during the last week of May, 1897.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 3 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

The *Engineers' Club of Columbus*, (O.), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Master Car Builders' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 8, 1897.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *National Association of Local Freight Agents' Associations* will hold a convention at Washington, D. C., on June 8, 1897.

The *National Convention of Railroad Commissioners* will be held at St. Louis, Mo., on May 11, 1897.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Train Dispatchers' Association of America* will hold a convention at Detroit, Mich., on June 22, 1897.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sarge, Jr., 1533 Marquette Building Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

**Henry Electrical Society.**

Mr. W. B. Potter, Chief Railroad Engineer of the General Electric Co., will deliver a lecture at the rooms of the society, 111 West Thirty-eighth street, New York City, April 2, on "Electric Railroad Varieties." The lecture is to be illustrated by slides.

On April 23 Mr. Alexander Stratton will deliver a lecture on "The Use of Different Kinds of Iron and Steel in Dynamo Electric Machines."

**Western Society of Engineers.**

The Western Society of Engineers held a meeting Wednesday evening, March 24, at the Technical Club, Chicago. Mr. Clement F. Street presented a paper on "Railway Ties in India," which described several types of metal ties in common use on the Indian railroads.

The discussion showed that the members present did not favor the use of metal ties in this country. The next meeting will be held April 7, when Mr. E. R. Shnoble will read a paper on "Deflection of Wooden Stringers," and Mr. R. D. Seymour a paper on "The Britts Landing Cable Hoist and Quarry."

**Montana Society of Engineers.**

A regular monthly meeting of the Montana Society of Engineers was held in Helena on March 13. A considerable discussion was held on the methods of road improvements, following which a resolution was passed to request the County Surveyor of Lewis and Clarke County to call a convention of county surveyors at an early date in order to further the carrying out of a recent act passed by the Legislative Assembly of the State of Montana in regard to the economic construction and maintenance of the roads and bridges of that state. A paper by Mr. Charles Tappan, on "Mineral Surveys," was postponed until the next regular meeting of the society.

**St. Louis Railway Club.**

The St. Louis Railway Club met at the Southern Hotel, St. Louis, on March 12, 97 members being present. The election of 26 new members was reported, 18 being elected active members, and eight associates. It was decided that hereafter the regular meetings would be held in St. Louis on the second Friday of each month at 3 p. m. at such place as the Executive Committee should select. Two papers were presented, one entitled "Motive Power Accounting," by Mr. W. G. Taylor, Chief Clerk, Motive Power Department, Cleveland, Cincinnati, Chicago & St. Louis, the other, "Car Service Associations in Relation to Car Movements," by Mr. W. M. Prall, Manager of the St. Louis Car Service Association. Eighteen applications for membership were received. The next meeting will be held at the Southern Hotel, April 9, when Mr. G. W. Rhodes, Superintendent Motive Power, Chicago, Burlington & Quincy, will read a paper on "Air-brakes and Why it is Important to Maintain Them." As this will be the annual meeting, the officers for the ensuing year will be elected.

**Street Railway Accountants' Association of America.**

The meeting for organization of the Street Railway Accountants' Association of America was held in Cleveland, O., March 23 and 24, 1897. Representatives of 30 companies from various parts of the United States and Canada were present. A number of reports, a list of which was given in our recent issue of March 19, page 212, were read, and a general discussion followed. An interesting feature of the meeting was the display of blanks and forms used in the accounting department of street railroads. These were carefully examined by the delegates. The following officers were elected for the ensuing term: President, Henry L. Wilson, Boston, Mass.; First Vice-President, C. N. Duffy, St. Louis, Mo.; Second Vice-President, J. F. Calderwood, Minneapolis, Minn.; Third Vice-President, C. B. Reavis, Augusta, Ga.; Secretary and Treasurer, W. B. Brockway, Toledo, O.; Executive Committee, the foregoing and Dana Stevens, Washington, D. C.; W. S. Dimmock, Council Bluffs, Ia.; W. J. Ros, Montreal, Can.; E. R. L. Tighe, Brooklyn, N. Y. The next meeting will be held at Niagara Falls, Oct. 19, 1897.

**Engineers' Club of Philadelphia.**

At the regular meeting of the club on March 20, Prof. Lewis M. Haupt, a visitor, made a few remarks upon the construction of reservoirs for the storage of water in large quantity. He believed that the claim sometimes made that all reservoirs leak is an incorrect one, and he referred to a number of instances where leakage was prevented by the sides of the reservoir having been properly puddled. In his opinion, pure clay is not suitable for puddling, and is one of the most dangerous materials to be handled. The contractor should take the entire risk in building a reservoir specified to contain a certain number of gallons of water for a certain amount of money.

Mr. John C. Trautwine, Jr., then presented a paper on "The Construction of the Queen Lane Reservoir, Philadelphia," on behalf of the late Mr. Amasa Ely. With the aid of a series of drawings and photographic views projected by an electric lantern, Mr. Trautwine described the location of the reservoir, its general plan, and the details of its construction, including the slope of its walls and the method of lining them and the floor of the basin, the arrangement of rolls by which the clay was puddled, the pass pipes connecting the two basins, and the inlet fountain through which the water was pumped to either or both basins, etc. The intended depth of water in these basins was 30 ft., and though they both leaked considerably when finished by the contractor, they are now being repaired, with the result that one basin holds its full depth of water with no appreciable leakage, and the other is already much improved. At the conclusion of Mr. Trautwine's description, the question of leakage in these and other reservoirs was fully discussed by Messrs. John Birkinbine, J. Kay Little, Edwin F. Smith (who promised a short paper on the subject), L. Y. Schermerhorn and E. M. Nichols.

#### PERSONAL.

—Mr. Robert Hancock has been elected President of Atlantic & North Carolina.

—Mr. Jesse Cleveland has been elected Assistant Treasurer of the Charleston & Western Carolina.

—Mr. P. H. Conlisk has been appointed Local Freight Agent of the Missouri, Kansas & Texas, at Dallas, Tex.

—Dr. P. G. Cornish has been appointed Chief Surgeon of the Atlantic & Pacific, to succeed Dr. J. P. Kaster, resigned.

—Mr. E. B. Cushing has been appointed Chief Engineer and General Superintendent of the Houston, East & West Texas.

—Mr. George M. Tileston, Secretary of the Huntington Railroad, died suddenly at his home in Huntington, L. I., on March 25.

—Mr. I. W. Troxell has been appointed General Manager of the Queen Anne's Railroad, the headquarters of which are in Baltimore, Md.

—Mr. Charles A. Beach, formerly General Superintendent of the South Jersey Railroad, has been appointed General Manager of the company.

—Mr. John D. Jackson, at one time Chief Engineer of the Wilmington & Weston, which now forms a part of the Baltimore & Ohio, died recently at Hockessin, Del., aged 79 years.

—Mr. Lucius J. Polk, General Manager of the Gulf, Colorado & Santa Fe, has been appointed a member of the staff of Governor Culberson, of Texas, with the rank of Lieutenant-Colonel.

—Mr. W. A. Garrett, Superintendent of the Western Division of the Wabash Railroad, at Moberly, Mo., on April 1 took charge of the Illinois lines of that company, with headquarters at Decatur, Ill.

—Mr. John W. Patton, Engineer of Maintenance of Way and Roadmaster of the Monongahela River Railroad, was struck by a train and instantly killed at Clarksburgh, W. Va., on March 25.

—Mr. H. O. Wilson, formerly Passenger and Freight Agent in Helena, Mont., for the Union Pacific, has been appointed Chief Clerk in the general freight office of the Oregon Short Line, at Salt Lake City.

—Mr. Washington F. Wilcox has been nominated by Governor Cooke, of Connecticut, to succeed Mr. George M. Woodruff, of the Connecticut Board of Railroad Commissioners, whose term expires on July 1.

—Mr. S. M. Felton has been selected by the Reorganization Committee of the Columbus, Sandusky & Hocking to examine the property as an expert and report on its condition, value and needed improvements.

—Mr. David Brown, First Assistant General Freight Agent of the Grand Trunk, with headquarters at Chicago, has been elected Chairman of the Rules and Regulations Committee of the Central Freight Association.

—Mr. H. Ridgeway has been appointed Master Mechanic of the Chihuahua Division of the Mexican Central, with headquarters at Chihuahua, to succeed Mr. T. Smethurst, who has resigned to accept another position with the company.

—Mr. Edwin Adams, who, until recently, was General Freight and Ticket Agent in Kansas and Indian Territory for the Missouri, Kansas & Texas, with headquarters at Parsons, Kan., has been appointed Traveling Passenger and Freight Agent of the Choctaw, Oklahoma & Gulf.

—Mr. Joel West, Master Mechanic of the Chicago, Burlington & Quincy, at West Burlington, Ia., died March 23 at Los Angeles, Cal., to which place he went about a month ago hoping to benefit his health. Mr. West had held his late position since June, 1876. He was 62 years old.

—Messrs. William A. Haven and Edwin H. McHenry were elected honorary members of the Montana Society of Engineers at the regular monthly meeting of that society held on March 13. Mr. Haven was at one time engineer in charge of location and construction of branch lines of the Northern Pacific in Montana. He entered the employ of the Erie Railroad about the middle of the year 1896, and is now located at Buffalo, representing the interests of the road in the elimination of grade crossings at that place. Mr. McHenry was for a number of years Assistant Engineer on the Northern Pacific, afterward being promoted to be Division and Chief Engineer. For a time he was Receiver, and on the reorganization of the road he returned to his present position as Chief Engineer.

**ELECTIONS AND APPOINTMENTS.**

**Atchison, Topeka & Santa Fe.**—Albert Andrews, formerly Traveling Freight Agent, with headquarters in Pittsburgh, Pa., has been appointed Commercial Freight Agent, with headquarters at Milwaukee, Wis.

August F. Mack has been appointed Traveling Freight Agent, with headquarters at Pittsburgh, to succeed Mr. Andrews.

**Atlantic & Danville.**—The annual meeting of stockholders was held in Norfolk, Va., on March 23, when all of the old Board of Directors was re-elected except A. Gerst, who was succeeded by A. B. Carrington. The directors then re-elected the present officers of the company. Charles O. Haines, formerly Superintendent and Chief Engineer, has been appointed General Man-



ager to succeed C. D. Owens, deceased; William H. Taylor, formerly General Freight and Passenger Agent, has been appointed Traffic Manager; H. E. Hutchins has been appointed Assistant Superintendent, with headquarters at Norfolk, Va.

**Atlantic & North Carolina.**—Under the provisions of an act of the General Assembly passed a month ago, Governor Russell, of North Carolina, has appointed the following Board of Directors, after summarily ousting from office the old (Democratic) board, and their President, H. S. Chadwick: E. H. Meadows, Robt. Hancock, Wm. Chadbourn, J. S. Mewborne, W. J. Polk, W. H. Sawyer, T. B. Hewitt, C. G. Wooten. These have elected Robert Hancock President. He made formal demand on the old officers for possession last week and it was surrendered under protest.

**Carolina & Northwestern.**—Officers of this company, formerly the Chester & Lenoir, have been elected as follows: President, G. W. F. Harper; Superintendent and Purchasing Agent, L. T. Nichols; Auditor, E. F. Reid; General Freight and Passenger Agent, S. T. Pender.

**Cincinnati & Muskingum Valley.**—At a meeting of the stockholders, held on March 23, the present officers and Board of Directors were re-elected.

**Great Northern.**—O. O. Winter, formerly Assistant General Superintendent of the Eastern District, has been transferred to the Western District, with headquarters at Spokane, Wash., to succeed Russell Harding. J. M. Gruber, formerly General Superintendent of the Montana Central, a proprietary line of the company, has been appointed to succeed Mr. Winter, with headquarters at St. Paul, Minn. G. R. Martin has been appointed General Superintendent of the Montana Central, with headquarters at Great Falls, Mont., to succeed Mr. Gruber.

**Gulf, Beaumont & Kansas City.**—At the annual meeting of stockholders, held in Beaumont, Tex., March 20, the present Board of Directors was re-elected. At a subsequent meeting of the directors officers were elected as follows: President, E. E. Pratt, Boston, Mass.; Vice-President and General Manager, John H. Kirby, Houston, Tex.; Treasurer, W. W. Willson; Assistant Treasurer, N. D. Silsbee; Secretary, Fred A. Helbig; Assistant Secretary, George D. Silsbee. The following appointments have been made: W. W. Willson, Assistant General Manager; Mark Weiss, General Passenger and Ticket Agent; J. H. Phillips, Traffic Manager; Frank M. Aldridge, General Superintendent; Fred A. Helbig, General Auditor and Frank G. Papineau, Master Mechanic.

**Kansas City, Fort Scott & Memphis.**—The following appointments have recently been announced: H. G. Wilson, Commercial Agent, at Kansas City; E. J. Perry, Commercial Agent, at Springfield, Mo., to succeed E. E. Smythe; I. C. Preston, Commercial Agent, at New Orleans, La., to succeed R. W. Lightburne, Jr.

**Lehigh Valley.**—The following appointments took effect April 1: John I. Kinsey, Superintendent of Machinery, with headquarters at Easton, Pa.; Philip Wallis, Master Mechanic, at Easton, Pa., to succeed John I. Kinsey; Fred. Roth, Master Mechanic, at Delano, Pa., to succeed Philip Wallis, transferred; Howard D. Taylor, Master Mechanic, at Wilkes-Barre, Pa., to succeed Fred. Roth, transferred; F. F. Gaines, Mechanical Engineer of the Motive Power Department, to succeed H. D. Taylor, promoted.

**Mexican National.**—W. B. Ryan, formerly General Eastern Agent, has been appointed Assistant General Freight and Passenger Agent, with headquarters in the City of Mexico. W. F. Payton has been appointed Acting General Eastern Agent, with headquarters at New York City, to succeed W. B. Ryan, promoted. Both appointments took effect April 1.

**Pennsylvania.**—At the annual election for directors, held at the company's office in Philadelphia, on March 23, the following directors were elected for the ensuing year: Frank Thomson, Alexander M. Fox, Alexander Biddle, N. Parker Shortridge, William L. Elkins, Alexander J. Cassatt, Clement A. Griscom, Benjamin B. Comegys, Amos R. Little, William H. Barnes, George Wood, C. Stuart Patterson, Effingham B. Morris, John P. Green, Charles E. Pugh, Sutherland M. Prevost.

**Pittsburgh, Wheeling & Kentucky.**—At the annual meeting of stockholders, held in Wheeling, W. Va., on March 27, the present officers and Board of Directors were re-elected.

**St. Louis & Cairo.**—At the annual meeting of directors, held in East St. Louis on March 27, the following officers were elected: President, F. A. Horsey, New York; Vice-President, F. Bross; Secretary, P. W. Abbott.

**Southern.**—J. H. Barrett has been appointed Superintendent of Transportation, with headquarters at Washington, D. C. He will have general supervision of the train service and perform the duties heretofore devolving upon the superintendent of Car Service, the latter office having been abolished. The office of Assistant General Superintendent at Chattanooga has been abolished and the jurisdiction of J. S. B. Thompson, Assistant General Superintendent, has been extended over the Fourth Division. The line between Columbus and McDonough, formerly known as the Columbus Division, is now operated as part of the Fifth Division, and W. A. Vaughan has been appointed Superintendent to succeed J. H. Barrett. The lines formerly embraced in the First Division are now operated as the Richmond Division, and W. T. West has been appointed Superintendent, with headquarters at Richmond, Va.

**Texas & Pacific.**—The title of B. F. Darbyshire has been changed from General Agent at El Paso, Tex., to Southwestern Freight and Passenger Agent, with headquarters at El Paso. The title of R. H. Carrington has been changed from General Agent at New York City to Eastern Freight and Passenger Agent, with headquarters at New York.

**Toronto, Hamilton & Buffalo.**—The following appointments took effect April 1: R. H. L'Hommedieu, General Superintendent, Detroit, Mich.; B. B. Mitchell, General Freight Traffic Manager, Detroit, Mich.; O. W. Ruggles, General Passenger Agent, Chicago, Ill.; A. Torrey, Chief Engineer, Detroit, Mich.; Robert Miller, Superintendent Motive Power and Equipment, Detroit, Mich.; A. J. Burt, Auditor, Detroit, Mich.; J. R. Dutton, Purchasing Agent, Detroit, Mich.; C. H. Bieber, General Car Accountant, Detroit, Mich.

**Washington, Alexandria & Mt. Vernon.**—At a meeting of the Directors, held on March 24, the following officers were elected: President, G. E. Abbott; Vice President, Park Agnew; Secretary, F. K. Hipple; Treasurer, D. C. Leech; General Superintendent, Joseph Colvin.

**Weiser, Idaho & Spokane.**—The directors of this com

pany, recently incorporated in Idaho, are Thomas W. Bates, J. R. Numbers, F. R. Coffin, George M. Waterhouse and George G. Glover. Frank T. French is Secretary.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Alabama River Barge Line & Railroad Co.**—This company, recently chartered in Alabama, has elected E. C. Machen, of New York, President; W. H. Tisdale, Vice-President, and B. S. Bibb, Secretary and Treasurer. The company proposes building a road from Blockton, Ala., south 53 miles to Selma, and to establish a barge line for the transportation of coal, which it is expected will be the principal business, from that point down the Alabama River to Mobile.

**Bridgeton & Saco River.**—An extension is proposed from the present northern terminus at Bridgeton, Cumberland County, Me., north about five miles to Harrison. The road now extends from Bridgeton Junction, on the Saco River, north 16 miles to Bridgeton, connecting with the Maine Central at Bridgeton Junction. It is expected that the extension will be built this summer.

**Erie Eastern.**—The preliminary survey for this road, which is proposed from Erie, Pa., south to a connection with the Erie Railroad at or near Mill Village, Erie County, via the borough of Waterford, a total length of about 19 miles, was begun March 22.

**Houston & Texas Western.**—This company was chartered in Texas on March 26 with a capital stock of \$300,000. It is proposed to build a road from Houston, Tex., in a general westerly direction through the counties of Harris, Fort Bend, Waller and Austin to Sealy, in Austin County, passing through Pattison, a total distance of 153 miles. An extension is also proposed from Pattison northwest about 70 miles through the counties of Waller, Washington and Burleson to a point on the Brazos River, near Stone City. It is proposed to begin work this season. The principal office is at Houston, Tex. The incorporators are: Edwin S. Hooley, Henry Zuckerman, Eben B. Crane, Wm. C. Merriman, Jr., B. E. Orr, W. J. Hoffman, J. S. Bache, F. W. Heidekoper and Wm. W. Worthington, of New York City; Elijah J. Smith, of Oregon; Prosper W. Smith, of Boston; Paul F. Mohr, of Tacoma; John B. Lyon, Albert R. Kellogg and Sanford B. French, of Chicago; Charles B. Peck, Thomas Keller and L. L. Mitchell, of Houston; Fred. R. Hubbell, of Texarkana, and Leon H. Blum and J. H. Hawley, of Galveston.

**Little Kanawha Valley.**—The final surveys for the road were begun at Parkersburg, W. Va., on March 20, and it is expected that grading will be begun some time during the present month.

**Mississippi River & Northwestern.**—An extension of this road in Arkansas, from its present northern terminus to Pendleton, Stuttgart and Hot Springs, is proposed, and General Manager A. Kimball states that work will be begun this spring. The line will extend in a general northwesterly direction 55 miles to Stuttgart, by way of Pendleton, thence nearly due west 90 miles to Hot Springs. The road now extends from Arkansas City, 11 miles, in a general northwesterly direction.

**Mobile & Ohio.**—J. W. Woolfolk, President of the Hanover Construction Co. which holds the general contract for building the Montgomery, Tuscaloosa & Memphis, an extension of this road from Columbus, Miss., to Montgomery, Ala., states that the contract for 100 miles of grading and bridging on the line will be sublet on April 5, at Birmingham, Ala.

**New Roads.**—Surveys are now being made under the direction of J. P. Thompson, of Fairmont, for a road to extend from Fairmont, in Marion County, W. Va., south about 24 miles along Simpson's Creek to the coalfields at Flemington, in Taylor County. A connection with the Baltimore & Ohio is proposed at a point near Fairmont.

**Pensacola, Alabama & Tennessee.**—This company was incorporated in Alabama on March 25, with a capital stock of \$100,000, to build a railroad (referred to in these columns last week under new roads), from a point in the Birmingham coalfields in Northern Alabama through Alabama and Florida to Pensacola, Fla. The incorporators are: Henry McLaughlin, St. Louis, Mo.; L. Hilton Green, R. M. Robinson, A. C. Blount, Jr., C. W. Hagerman, Pensacola, Fla.; R. H. Elliott, H. G. Robinson and John H. Robinson, Birmingham; J. S. Foster and Robert L. Little, Jasper, and W. J. Hendley, Birmingham.

**Pittsburgh, Bessemer & Lake Erie.**—Work has been begun on straightening the double curve on this line at a point two miles south of Conneautville, Pa. A cut 45 ft. deep and 1,040 ft. long will have to be made at this point.

**Short Line (W. Va.).**—It is expected that construction work will be begun again within a few weeks on this road, which is proposed from New Martinsville, W. Va., southeast to Clarksburg, W. Va. Surveys were made and work was begun last year, when it was discontinued to await the result of a suit brought by citizens of Parkersburg against the Little Kanawha Valley Railroad. The suit was instituted to secure an injunction to prevent the subscriptions of stock made by the counties through which it is proposed to pass from being made, this company being interested in similar subscriptions. Joseph Fucy has the contract for the entire line of about 40 miles. It is said that liberal subscriptions have been made by the counties in question.

**Sierra (Cal.).**—The contract for the first 10 miles of this road, which is proposed from Oakdale, Stanislaus County, Cal., northeast to Sonora, Tuolumne County, has been given to the West Coast Construction Co. It is expected that work will be begun at once.

**Weiser, Idaho & Spokane.**—This company, which has been formed by a reorganization of the Weiser, Idaho & Northern, has been incorporated in Idaho to build a road from Weiser, Washington County, north through the counties of Washington, Idaho and Nez Perces, to Lewiston, with one branch from Weiser south to Payette, and another branch, in Washington County, west to the copper-mining district, in the Seven Devils Mountains. Preliminary surveys have been made between Payette and the copper mines, and the general contract for that portion of the line has been given to the New York Construction Co. This company has sublet the contract for 45 miles of the road to Wilkerson & Reagh, of Salt Lake City, and it is expected that work will be begun at once at Payette. The citizens of that place have subscribed \$10,000 in cash and about 1,000 acres of land. The sub-contract calls for the completion of the 45 miles within six months. E. E. Forshey, Weiser, Idaho, is Chief Engineer, and T. A. Clark, Locating Engineer.

A list of the directors of the company is given in another column.

**Yankton & Norfolk.**—At the recent annual meeting of the company resolutions were adopted to cancel the contract made with the Traffic Construction Co. for building this road which is proposed from Yankton, S. Dak., south 60 miles to Norfolk, Neb. The contract was made on Jan. 6, 1892, and the construction company has failed to comply with its terms. It was further resolved to make another contract with Mr. Daniel Bacon, of New York City, to build the road from Yankton to Norfolk and also from Norfolk to Superior, Neb.

#### Electric Railroad Construction.

**Aurora, N. Y.**—The Buffalo, Orchard Park & Aurora Railroad Co. has been incorporated.

**Black River Falls, Wis.**—The building of the electric railroad from La Crosse to Neillsville, through Black River Falls, a distance of 15 miles, is being considered. The surveyed route has been considered a feasible one.

**Bradford, Pa.**—At last week's meeting of the Council the ordinance granting the Bradford Electric Street Railway Co. the right to build an electric road on East Main street passed its third reading.

The work of constructing the Olean, Rock City & Bradford Electric Railroad has been commenced. It is expected that the line between Bradford and Red Rock will be in operation by the last of this month, and all of the new lines by June 1.

**Brooklyn, N. Y.**—The Nassau Electric Railway Co. has arranged for the present to run its cars from Greenwood Cemetery to Brooklyn Bridge by the way of Ninth, Flatbush and Atlantic avenues, and cars were put in operation on March 24. The running time will be about 28 minutes, and the new route will be known as the Prospect Park line. Arrangements will probably be made to make this a permanent route.

**Elizabeth, N. J.**—The Westfield & Elizabeth Street Railway Co. has been incorporated with a view of constructing along the line of Westfield avenue, from Elizabeth to Plainfield, making a connecting link between the Consolidated lines at Elizabeth and the Plainfield Street Railroad at Plainfield, running from Elizabeth, through Roselle, Cranford and Westfield. The company is securing the necessary consents from property owners and the applications for franchises to the several township committees are being made. It is the purpose of the company to build the line during the early summer and have it in operation as near Aug. 1 as possible. The road will be double-tracked, constructed in the best possible manner, and will be about 12 miles in length.

**Gardner, Mass.**—James Stetes, of West Gardner, states that preliminary surveys are in progress for the Gardner, Westminster & Fitchburg Street Railroad, which proposes to build 10 miles of line in the vicinity of Gardner.

**Hamilton, Ont.**—At a recent meeting of the shareholders of the Hamilton, Chedoke & Ancaster Electric Railway Co. it was decided to ask the Legislature for a supplementary charter and for the extension of the line to Mohawk Park and Brantford.

**Huntington, W. Va.**—The Consolidated Light, Heat & Railway Co., which operates the surface lines in Huntington, has ordered the entire line relaid with heavy rails. The work has begun, and is progressing rapidly, nearly a mile of the new track having been put in. An extension of the present track will be built to the railroad shops on the south side.

**Janesville, Wis.**—The President of the Janesville Street Railway Co. informs us that it has decided to rebuild the power-house and car barn recently destroyed by fire.

**London, Ont.**—The London Street Railway Co. will extend its Springbank line to Byron, at a cost of \$10,000.

**Long Branch, N. J.**—The fourth application for a franchise for an electric road parallel to Broadway in Long Branch was made March 28 by the Atlantic Highlands, Red Bank & Long Branch Railway Co. The company has purchased private right of way nearly the entire distance.

**Meadville, Pa.**—On Monday of this week the work of surveying the new electric road was begun. A part of the line will be laid in Meadville, and a line is proposed to Saegertown.

**Neponset, Mass.**—The Forest Hills & Quincy Street Railway Co. has applied to the Legislature for a charter to construct an electric road 5 miles in length.

**Newton, Mass.**—The Railroad Commissioners have granted the application of the Newton & Boston Street Railway to extend its track to Needham, as previously noted in these columns.

**New York.**—A public hearing will be given on April 15 relating to the application by the Metropolitan Traction Co. to change the motive power on many of its existing lines.

**Peterborough, Can.**—The Peterborough & Ashburnham Street Railway are planning to build 1½ miles of road this summer. T. E. Bradburn is General Manager.

**Philadelphia, Pa.**—Our correspondent informs us that bids are being received for the erection of two passenger stations for the Fairmount Park Transportation Co. at Thirty-third street and Ridge avenue and Belmont and Elm avenues.

**Pittsburgh, Kan.**—The Pittsburgh, Weir & Columbus Railroad has been partially completed. When completed, the road as proposed will be about 20 miles in length.

A survey has been completed and the right of way secured for extending the Little Sawmill Run Railroad to join the Pittsburgh, Bessemer & Lake Erie at Duquesne, with a branch to tap the Monongahela River coal territory and join the Baltimore & Ohio at Peters Creek. It will also join the Pittsburgh & Lake Erie at West Carson and Main streets, and also make connections with the Panhandle, from whence coal can be shipped by way of the Ohio River connecting bridge over the Pennsylvania lines. J. D. Callery, J. S. Scully, J. C. Reilly and John Burns are the promoters of the new line, and it is stated have solicited bids for its construction.

**Port Chester, N. Y.**—The Port Chester Street Railway Co. has made a formal application for a franchise for a line through the streets of the village of Rye to Rye Beach. The application will be considered by the Highway Commissioners at a meeting in Rye on April 12.

**Tamaqua, Pa.**—The Tamaqua & Lansford Street Railroad will be commenced in a few days. The road will run direct to Summit Hill, connecting with Mauch Chunk by way of the Switchback Railroad.



**Westfield, Mass.**—The Woronoco Street Railway Co. has voted to increase its capital stock \$50,000 and is considering the construction of an extension eastward through Main street about three miles toward Springfield. The former plans for an extension in this direction contemplated a line through Union street, and the settlement of the matter still depends upon action by the town authorities.

**West Newton, Pa.**—Surveys have been completed and considerable of the right of way secured for the West Newton Northern Street Railroad, which is to run from Bell Vernon to West Newton, a distance of 17 miles. Contracts will be let within a short time after all the right of way has been secured. Engineers, Alcorn & Mill, Greenburg, Pa. The road was granted a charter on Feb. 1, as noted in our issue of Feb. 12.

**White Plains, N. Y.**—The White Plains & Elmsford Trolley Co. has resumed operations on the extension of its line to Tarrytown. A large force of workmen is now engaged in laying rails and grading the road west of Glenville.

**Winnipeg, Man.**—Application has been made to the Dominion Parliament for the incorporation of the Winnipeg, Duluth & Hudson Bay Railway Co., to build an electric and steam railroad from the Manitoba boundary to Hudson Bay.

#### GENERAL RAILROAD NEWS.

**Allegheny & Kinzua.**—At Buffalo, N. Y., on March 29, Judge Lambert appointed F. W. Kruse, of Olean, N. Y., Receiver, pending the result of an action to recover certain money alleged to have been loaned on worthless bonds by the Central Trust Co., of New York. The road extends from Bradford, Pa., to Coffee Run, Pa., 14 miles; from Redhouse, N. Y., to Gilbert, Pa., 21 miles, and from Shingle Mill to Zelliffe, N. Y., 6 miles.

**Atchison, Topeka & Santa Fe.**—The earnings for February, and for the eight months ending Feb. 28, were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$2,192,901	\$2,208,952	D. \$16,051
Oper. expen.	1,704,092	1,592,270	I. 111,822
Net earn.	\$488,809	\$616,682	D. \$127,873
Taxes and rentals.	138,264	160,961	D. 2,697
Inc. from oper.	\$337,545	\$455,721	D. \$118,176
Gross earn.	\$20,617,208	\$20,172,578	I. \$544,630
Oper. expen.	14,708,845	15,177,444	D. 468,599
Net earn.	\$5,913,363	\$4,995,134	I. \$918,229
Taxes and rentals.	1,270,182	1,297,772	D. 27,590
Income from oper.	\$1,643,181	\$3,628,062	I. \$1,015,119

Arrangements are now being made with the Southern Pacific for an exchange of the New Mexico & Arizona Railroad and the Sonora Railway, together extending from Benson, Ariz., to Guaymas, Mexico, and owned by this company, for the Mojave Division of the Atlantic & Pacific, extending from the Needles, Cal., to Mojave, and owned by the Southern Pacific. The Atlantic & Pacific has been paying \$436,266 annual rental for the Mojave Division, under a contract to purchase the road at \$30,000 per mile, payable in 1905, when the Southern Pacific mortgage matures, and a clear title can be made to the 242 miles. The new arrangement will probably be carried into effect through an exchange of leases until such time as good title can be made, so that the above annual rental charge against the Atlantic & Pacific will disappear. The Atchison lines to be leased to the Southern Pacific in exchange therefore comprise 350 miles, of which 262 miles are in Mexico. They are entirely disconnected from the remainder of the Atchison system, the distance from Deming to Benson being 175 miles, for which the Atchison has been obliged to use the line of the Southern Pacific in order to reach its own property. Their net earnings for the six months ending June 30, 1896, as shown by the last Atchison annual report, aggregated \$73,254.20, American currency, or at about the rate of \$150,000 per year. It is evident that the position of the Atchison will be financially improved, and that it will be benefited from an operating standpoint by surrendering a piece of road which has been operated under many embarrassments, and which has been of comparatively little value to the system, for an assured title to the only missing link in its transcontinental line. The Southern Pacific obtains a line with which it connects directly, being the only road now built in the State of Sonora. It obtains control of the harbor of Guaymas, enabling it to reach by easy steamer connection the entire west coast of Mexico and the Central American States.

**Atlantic & North Carolina.**—On March 29 William R. Tucker, of Raleigh, secured from the United States Circuit in Charleston, a temporary injunction restraining Governor Russell and the newly appointed board of directors of this road, appointed by the Governor under the provisions of a recent law, from attempting to carry into effect the provisions of this new law, which virtually gives the governor complete control of the property. The restraining order is made returnable at Greensboro April 6. Mr. Tucker is the largest private stockholder in the road, owning about \$150,000 worth of the stock. He wants to have the recent laws passed upon by the courts, believing them unconstitutional. Governor Russell had already appointed a new board of directors.

**Atlantic & Pacific.**—Special Master Owen N. Marron has advertised that pursuant to the decree of foreclosure and sale made and entered on April 10, 1896, by the District Court of the Second Judicial District of New Mexico, the Western Division of the road will be sold on May 3 next at public auction at Gallup, Bernalillo County, N. Mex. The sale will be made on the petition of the United States Trust Co., of New York. This division extends from Albuquerque, on the Rio Grande River, New Mexico, in a general westerly direction through New Mexico and Arizona to the headwaters of the Colorado Chiquito, thence to the Colorado River and across that river to The Needles, Cal., thence as the said line has been, or may be, located or built to the Pacific Ocean. No bids will be accepted for a less sum than \$5,000,000, and \$100,000 will be required to be deposited as guarantee before bids will be accepted.

**Brooklyn Elevated.**—On March 25 Justice Van Wyck, in the Supreme Court, in Brooklyn, appointed President Frederick Uhlmann Receiver of the company. This action was taken on the application of the Central Trust Co., of New York, which demands a sale of the property and franchises of this road, of the Union Elevated and of the Seaside & Brooklyn Bridge Elevated Railroad. Following this receivership, a plan of reorganization has been drawn up by a committee, consisting of F. P. Olcott, Chairman; James T. Woodward, Charles Par-

sons, Ernst Thalmann and Leonard Lewisohn. This plan has been laid before the holders of first and second mortgage bonds and coupons and stock of the Brooklyn Elevated Railroad, to the holders of first mortgage bonds and coupons and second income mortgage bonds of the Union Elevated Railroad and to holders of first mortgage bonds and coupons of the Seaside & Brooklyn Bridge Elevated Railroad. The plan provides for a foreclosure of the mortgages, and it is proposed that the new company shall issue the following new securities: \$16,000,000 first mortgage bonds bearing interest at 4 per cent. until the year 1905 and 5 per cent. thereafter, the mortgage to cover all property and franchises of the new company, including property afterward acquired; \$5,000,000 5 per cent. non-cumulative preferred stock, and \$13,000,000 common stock. The holders of the outstanding first and second mortgage bonds and of the stock of the companies are requested to deposit such holdings with the Central Trust Co. subject to the order of the Reorganization Committee. Negotiable receipts will be issued for these deposited securities, and when, in the judgment of the committee, a sufficient amount of bonds shall have been so deposited the reorganization plan will be declared effective.

**Buffalo, Rochester & Pittsburgh.**—At a special meeting of stockholders held recently at Ridgway, Pa., it was decided to issue \$3,000,000 debenture coupon bonds at six per cent., payable semi-annually, to fund the present floating indebtedness, which amounts to \$900,000, and to provide new equipment.

**Canadian Pacific.**—The earnings for February and for the two months ending Feb. 28, have been reported as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$1,272,094	\$1,325,256	D. \$53,162
Oper. expen.	831,271	991,524	D. 160,253
Net earn.	\$387,823	\$333,732	I. \$54,091
Two months:			
Gross earn.	\$2,585,018	\$3,809,054	D. \$1,224,036
Oper. expen.	1,823,852	2,970,372	D. 1,146,520
Net earn.	\$761,166	\$829,682	D. \$68,516

**Carolina & Northwestern.**—The Railroad Commissioners of both North Carolina and South Carolina have been officially notified by the new company that the Chester & Lenoir has been reorganized under the above name and that the transfer of the property has been legally made. The road is narrow gauge and extends from Lenoir, S. C., about 109 miles, to Chester, S. C., using about 10 miles of the track of the Western North Carolina between Newton and Hickory, N. C. Of the mileage given, 72 miles is in North Carolina and the remainder in South Carolina. The new company took charge of the property on March 1.

**Central of New Jersey.**—Earnings for February and for the two months ending Feb. 28 have been reported as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$818,939	\$821,549	I. \$2,610
Oper. expen.	592,982	602,869	D. 9,887
Net earn.	\$255,957	\$218,680	I. \$37,277
Two months:			
Gross earn.	\$1,704,155	\$1,831,117	D. \$126,962
Oper. expen.	1,132,980	1,261,567	D. 128,587
Net earn.	\$571,175	\$569,550	I. \$1,625

**Chesapeake, Ohio & Northwestern.**—The rolling stock of the company was sold on March 27 by Receiver Boyle in consequence of the judgment given by Judge Lorton, of the United States Circuit Court, in Louisville, Ky., on Feb. 20, for \$600,914.46 against the Receiver in favor of the United States Trust Company, of New York. The Illinois Central, which now operates the road, bought the equipment, which included 533 box cars, 280 gondola cars, 9 refrigerator cars, 36 10-wheel locomotives, five 8-wheel locomotives and two 6-wheel locomotives.

**Chicago, Burlington & Quincy.**—The earnings for February and for the two months ending Feb. 28, were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$2,769,462	\$2,568,416	I. \$201,046
Oper. expen.	1,539,121	1,646,584	D. 107,463
Net earn.	\$1,230,341	\$921,832	I. 308,509
Two months:			
Gross earn.	\$5,442,000	\$5,162,021	I. \$279,979
Oper. expen.	3,294,103	3,446,863	D. 152,763
Net earn.	\$2,147,897	\$1,715,158	I. \$432,739

**Chicago, Milwaukee & St. Paul.**—Earnings for February and for the eight months ending Feb. 28, were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$2,119,739	\$2,305,679	D. \$185,940
Oper. expen.	1,334,208	1,565,978	D. 231,770
Net earn.	\$785,531	\$739,701	I. \$45,830
Eight months:			
Gross earn.	\$20,868,472	\$22,703,024	D. \$1,834,552
Oper. expen.	12,593,471	13,273,015	D. 679,543
Net earn.	\$8,275,001	\$9,430,009	D. \$1,155,008

**Danville & Mt. Morris.**—Operations on this road, which were suspended on Feb. 8, were resumed on March 25. The suspension was caused by a suit involving the right of way through certain swamp lands, and the plaintiff tore up the track on this land. The matter was finally settled out of court. The road, which extends from Danville northwest to Mt. Morris, N. Y., with about 15 miles of branches, has been in the hands of a Receiver since June, 1894.

**Erie.**—The earnings for February were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$2,175,542	\$2,148,807	I. \$26,735
Oper. expen.	1,785,609	1,774,511	I. 11,098
Net earn.	\$389,933	\$374,296	I. \$15,637

**Evansville & Richmond.**—The road was sold under foreclosure at Washington, Ind., on March 23, the sale being conducted by Sheriff J. G. Leming at the court house door. The property was bought by the Farmers' Loan & Trust Co., of New York, which was the only bidder, for \$1,413,712.80. The road was chartered on Sept. 10, 1888, to extend from Elmore to Richmond, Ind., 175 miles. Only 101.4 miles, however, between Elmore and Westport were built.

**Pittsburgh, Ohio Valley & Cincinnati.**—This road, which was closed on Feb. 22 on account of the damage done by the flood of that date in the Ohio Valley, was reopened on March 18, the repairs having been completed.

**Southern.**—The earnings for February and for the eight months ending Feb. 28 were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$1,570,922	\$1,569,584	I. \$1,338
Oper. expen.	1,062,172	1,075,983	D. 13,811
Net earn.	\$508,750	\$493,601	I. \$15,149
P. c. expen. to earn.	67.6	71.2	

Eight months:	1897.	1896.	Inc. or Dec.
Gross earn.	\$12,975,471	\$13,571,816	D. \$596,345
Oper. expen.	8,687,373	\$9,155,162	D. 467,789
Net earn.	\$4,288,098	\$4,416,654	D. \$128,556
P. c. expen. to earn.	66.9	67.4	

**Wabash.**—Earnings for February and for the eight months ending Feb. 28 were as follows:

February:	1897.	1896.	Inc. or Dec.
Gross earn.	\$862,559	\$926,271	D. \$63,712
Oper. expen.	589,246	668,532	D. 79,286
Net earn.	\$273,313	\$257,739	I. \$15,574
Eight months:	1897.	1896.	Inc. or Dec.
Gross earn.	\$7,831,977	\$8,880,970	D. \$1,048,993
Oper. expen.	5,461,036	6,253,011	D. 791,975
Net earn.	\$2,370,941	\$2,627,959	D. \$257,018

#### Electric Railroad News.

**Bridgeton, N. J.**—The company which recently purchased the lines of the South Jersey Traction Co. will be known as the Bridgeton & Millville Traction Co. The syndicate now in control of the road holds \$192,000 of the \$250,000 bonds of the former company.

**Chicago.**—The new mortgage covering the property of West Chicago Street Railway Co., which secures the new bond issue, will permit the company to issue \$2,500,000 of bonds in addition to the \$10,000,000 authorized by the first mortgage. The \$2,500,000 additional bonds, however, can be issued only to cover 75 per cent. of the cost of future permanent improvements.

The name of the Chicago Western Electric Street Railway Co. has been changed to that of the Chicago Western Elevated Electric Railway Co.

**Jersey City, N. J.**—The Consolidated Traction Co. of Jersey City reports that the value of the company's stock has advanced 10 per cent. during the past year; the operating expenses have been reduced 6 per cent. The number of cars in operation at the end of last year was 467, the number of miles run last year was 12,375,608. Seven miles of new track was laid.

**Millbury, Mass.**—The property of the Blackstone Valley Street Railway Co. will be sold at public auction at Millbury, on April 23. The terms are \$5,000 cash at the time of the sale and the balance within five days after the sale. The property includes 6½ miles of road, 3½ miles of which has been entirely completed with 72-lb. T-rails and the material for much of the uncompleted portion is distributed along the line. Open cars, trucks, feed wire, insulators, etc., are among the appurtenances.

**Philadelphia.**—The Board of Directors of the East Penn Traction Co. has elected A. S. Cadwallader, of Fallsington, President; T. H. Atkinson, of Buckingham, Vice-President, and John C. McNaughton Treasurer. The increase of the capital stock to \$1,000,000 and an issue of first mortgage bonds of \$1,000,000 was approved at the last meeting.

**Tacoma, Wash.**—The electric lines owned by the Tacoma Railway & Motor Co., were sold under foreclosure on March 26 for \$100,000 to Howard C. Reavis, of New York.

#### TRAFFIC.

##### Chicago Traffic Matters.

CHICAGO, March 31, 1897.

Quiet has succeeded the panic that during the past week has raged in Chicago railroad circles, in consequence of the United States Supreme Court's decision, which immediately led to the abandonment of both the Western Freight and Western Passenger associations. Those two important traffic bodies are now nothing but "bureaus of information." The office force of the freight association has been practically suspended, and the members of the Board of Administration are doing little or nothing. Various meetings of lawyers and of the executive officials have been held, but the withdrawal from all traffic associations have in no instance been recalled. Rumors of rate cutting have been started, but they seem to be unfounded, no demoralization having developed thus far.

It is announced that the Interstate Commerce Commission will be here next week, and, in conjunction with the Board of Trade, will investigate alleged manipulations of export grain rates.

A new move is on foot in the West to get the anti-scalping bill through the present Congress.

The Baltimore & Ohio is to have a new lake and rail line to the East. Heretofore the Baltimore & Ohio has worked with the Anchor Line, which is controlled by the Pennsylvania, but now has acquired a number of fast freight steamers and will operate its own line from Chicago and Milwaukee to Fairport, O., where it has erected an elevator to hold 1,000,000 bush.

Eastbound shipments from Chicago and Chicago Junctions to points at and beyond the Western termini of the trunk lines for the week ending March 25 amounted to 100,310 tons, as compared with 102,327 tons the preceding week. This statement includes 47,780 tons of grain, 12,179 tons of flour and 11,083 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	WEEK ENDING MAR. 25.		WEEK ENDING MAR. 18.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	5,921	5.9	6,522	7.4
C., C. & St. Louis	7,947	7.9	8,121	7.7
Erie	11,523	11.5	12,265	10.7
Grand Trunk	8,445	8.4	10,497	9.1
L. S. & M. S.	12,891	12.9	15,894	11.2
Michigan Central	14,487	14.4	16,887	13.1
N. Y., Chi. & St. L.	12,703	12.7	13,299	11.0
Pitts., Cin., Chi. & St. Louis	7,367	7.3	9,943	8.9
Pitts., Ft. Wayne & Chicago	11,648	11.6	12,637	12.7
Wabash	7,378	7.4	6,913	8.2
Totals	100,310	100.0	102,327	100.0